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INTERNATIONAL



JANUARY 1955

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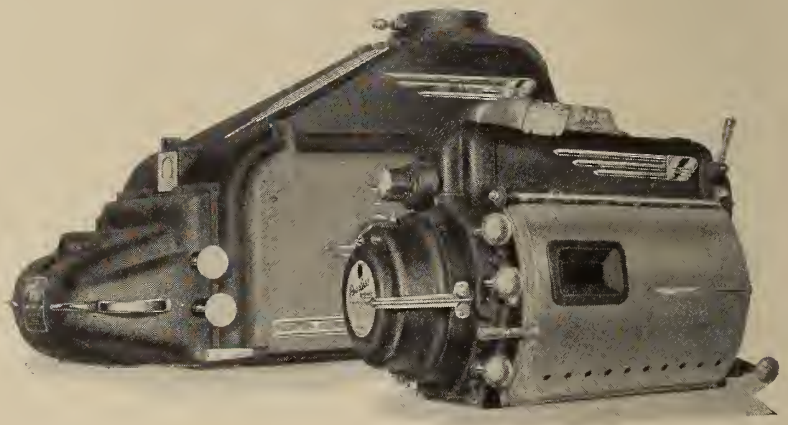
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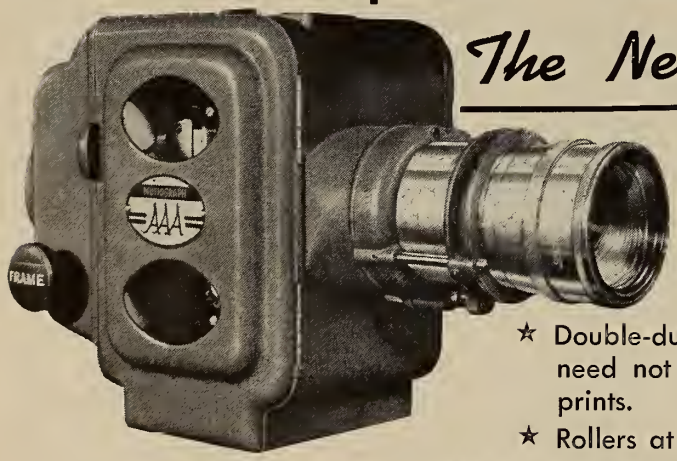
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INTERNATIONAL PROJECTIONIST

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Monthly Chat

Technicians Win Recognition

THE critical point in the development of modern motion picture presentation was reached when the various "new" processes engulfed the exhibition field. Technology, not subject to the whims of "gadgets," is Gospel today.

A swing around the theatre field in various sections of the country has convinced the writer that the most pressing projection problems at the moment is the ease with which the film stock is being chewed up heat-wise, by modern high-intensity light sources.

Scores of suggestions for alleviating this problem—some of them reflecting a great deal of serious thought, some of them borderline crackpot—have been advanced, but all these notions tend to neglect the fundamental requisite of cooling *not* the mechanism but the film itself!

"Well," say these eager-beaver projection practitioners, "this is a problem in chemistry for the manufacturers of film stock. We're just trying to correct an inherent error in the medium supplied to us."

"Well," responds IP, "why not meet the problem head-on by recognizing the basic difficulty instead of trying to peddle all sorts of expensive gadgets which serve to weigh down not simplify the projection process?"

There has always been a definite lack of (shall we say?) cohesion between the productive and the exhibition forces of the motion picture industry. Cost factors, utterly ignored on the production and exhibition fronts (you pick up the effort check, Mike) is the problem of translating the sum total of all the high-priced talent recruited by the "executive" brains of the industry into box-office dollars—which means their salaries as well as ours.

We who *show* the pictures to the *paying public* should be consulted on the basic problem of the motion picture industry—exhibition.

We who strain to *translate* the productive and distributive efforts of the industry should not only be advised in detail in advance of any technolgical change but should be consulted as to the best means for changing glamour pusses into box-office dollars.

This corner cannot remember a single occasion within the past 25 years when the projection craft was consulted on a contemplated change in technological standards. Many more years ago than we care to remember there arrived breathlessly in New York a representative of the studios who announced blandly that a new aspect ratio had been decided upon—with a major producer already in work on three feature releases. As an afterthought, this fellow decided to consult projection people, only to find out to his profound dismay that he was wrong! Why? Because in his pet studio projection rooms where they shot all stuff *on the level* they ignored completely the fact that the *average* projection angle in theatres was of the order of 15 degrees! This fellow nearly swooned when measurements showed that the angle in the N. Y. City Paramount Theatre was 26½ degrees. Result: all the studio-calculated characters would have their heads and feet cut off.

Technological problems being the prime interest in the motion picture industry today, there is no reason why a meeting of minds among various branches of this industry could not resolve all these matters on a mutually satisfactory basis—and this suggestion is advanced with the most constructive will in the world.

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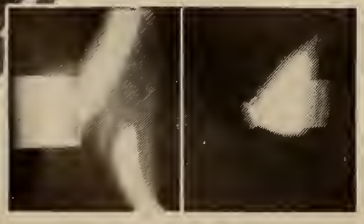
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INTERNATIONAL PROJECTIONIST

VOLUME XXX JANUARY 1955 NUMBER 1

The story of light for theatrical film projection is mostly the story of the carbon arc—most powerful of all illuminents.

Light Sources for Film Projection

By ROBERT A. MITCHELL

ELECTRICITY was not essential to the projection process in the days when the movies were silent and projectors were cranked by hand. "Picture halls" in rural districts often employed the *limelight* for illuminating the antics of the Keystone Kops. The "limelight," also called the calcium light, consisted of a small cylinder, or "pin," of quicklime (calcium oxide) heated to incandescence by the flame of the oxy-hydrogen blowpipe.

Hydrogen gas burns in air (about 1/5 oxygen by volume) with a hot, non-luminous flame. If it be made to burn in *pure* oxygen gas instead of air the flame is much hotter. By allowing the point of the flame to impinge upon the "lime-pin," a brilliant white light is produced.

Carbon Arc's Preeminence

The brightness of the limelight is inferior to that of the carbon arc; and because hydrogen is dangerously explosive when mixed with air or oxygen, the theatre laws of many cities prohibited the use of this illuminant.

The carbon arc was used in the earliest days of motion pictures. With continued improvement over the years, it has attained its present position of preeminence among the suitable light sources. The incandescent lamp was formerly used in small theatres as it is used even today for home movies; while the Xenon discharge bulb, a comparatively recent development, shows definite signs of supplanting low-amperage carbon arcs in small and medium-size theatres. But whatever new illuminants come along, the carbon arc will probably always be the undisputed king of light sources for projection on the larger screens.

The history of the carbon arc began late in 1809 when Sir Humphrey Davy connected two rods of charcoal (a form of carbon) to the terminals of a powerful voltaic battery, touched the ends of the rods together, and then separated them. A luminous bow, or arch, of electricty-conducting carbon vapor was instantly created, and this "arc" of hot gas heated the ends of the carbon rods to white-hot brilliance.

It was soon discovered that rods of coke—a hard, graphitic form of carbon—made possible brighter "arclights" than did charcoal. Modern carbons are made by mixing lampblack and pulverized petroleum coke with tar and pitch as bonding agents, moulding the "dough" into rods, and baking the soft rods until the bonding agents carbonize. But the commercial use of arclights had to wait until the dynamo was invented and perfected.

Chemistry of Carbon Mixture

About 1850 carbon arcs provided the illumination in French lighthouses; and by the end of the century the use of arcs for street illumination was commonplace.

Improvements in the carbon rods, or electrodes, greatly increased the efficiency of the arclight. Carbons were first made in moulds. Moulded carbons were seldom perfectly round, and their structure was often loose and granular. Arclamps in which moulded carbons were used sputtered and flickered violently.

The first major improvement in carbons was the extrusion or *forcing*, the doughy mixture through accurately-made dies. These "forced" carbons were purer and more uniform in texture and shape than moulded carbons, burning more smoothly and being less expensive. Understandably, they won the favor of their users. All modern carbons for searchlights and

motion-picture projectors are "forced" carbons.

It is not difficult to understand how an arclight works. When the switch is thrown to supply an electric current to the two carbon electrodes, nothing happens at first because the ends of the two carbons are separated by an air-gap, and the voltage is much too low to "jump" a spark between them and to start the arc burning. The projectionist, therefore, must touch the ends of the carbons together in order to establish an electric current.

Now, the point of contact offers so much resistance to the flow of the strong current that the ends of the carbons get hot and begin to vaporize—and carbon vapor is a conductor of electricity.

The projectionist then separates the two carbons until their ends are the proper distance apart—a quarter of an inch, more or less. Current continues to flow because the hot carbon gas conducts it, this gas assuming the characteristic form of a luminous arch called the *arc stream*. But even though the arc stream glows, most of the light comes from the tips of the carbons which are then heated to an incandescence which rivals the brilliance of the sun.

Carbon Thermal Capacity

Carbon is a peculiar substance. It is a chemical element—and even though it be not a metal, it nevertheless conducts current fairly well. Moreover, it remains a solid even up to a "white heat" of 6,638 degrees F. (3,670 degrees C.) a temperature far above the melting points of all known metals. And when carbon *does* attain this tremendously high temperature, it does not melt to a messy liquid but evaporates, or "sublimes," directly to a gaseous state.

If carbon did not possess these unusual properties, we could have no carbon arcs, without which the gigantic wide screens of modern movies would be impossible.

If an arc be examined through dark glasses to shield the eyes from its intense radiance, it will be seen that the brightest part is the tip of the carbon connected to the positive terminal of the source of direct current. The arc stream, as we said, is comparatively dull. The tip of the *negative* carbon is bright, but not nearly so bright as the end of the *positive* carbon. In the case of the low-intensity D.C. arc, about 90% of the light comes from the end of the positive carbon, 8% from the tip of the negative, and 2% from the arc stream.

Anatomy of the Positive Crater

Close inspection of the arc (Fig. 1) reveals that the white-hot tip of the positive electrode (anode) is a saucer-like *crater;* while that of the negative electrode (cathode) is a pencil-shaped point. It will also be seen that the arc stream connecting the two carbon ends consists of a dark violet-blue central core surrounded by a white flame.

In the blue core the volatilized carbon combines with the oxygen of the air to form carbon monoxide; while in the white flame both the carbon monoxide and carbon vapor burn to carbon dioxide. Rising up and flaming away from the arc stream is the yellow *tail-flame* of the arc.

In most motion picture projection systems, picture illumination is furnished *only* by the intensely radiant positive crater—the light from the negative tip, arc stream—and the tail-flame not being utilized.

But why is the crater of the positive carbon so much brighter, in D. C. arcs, than the tip of the negative carbon? To answer this question we shall have to tell what happens in the electric arc.

Electric current is a flow of electrons, those tiny particles of negative energy which whirl in dizzy orbits around the positively-charged central cores of atoms. The electrons move from the negative terminal of the current-source to the positive terminal. This direction of motion causes the electrons to pass from the tip of the negative carbon to the crater of the positive carbon.

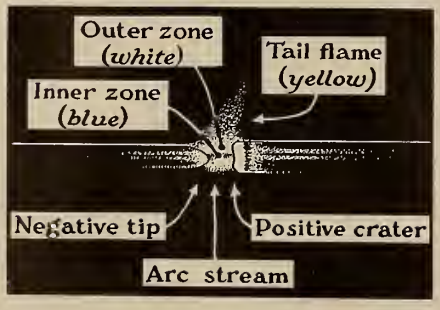


FIG. 1. The low-intensity arc as seen through a dark glass. About 90% of the total light is supplied by the white-hot solid carbon of the positive crater. The carbon boils away as a gas, but it immediately loses its brightness as it does so. The carbon vapor forms the current-conducting arc stream and finally dissipates itself as a tail-flame.

Very little energy is removed from the electrons as they pass from the tip of the negative carbon and enter the arc-stream, because the arc-stream, although tenuous, is very hot (about 10,823 degrees F. or 6,000 degrees C.) and is a good conductor of electricity. In other words, the voltage-drop between the tip of the negative and the arc-stream is slight, and, consequently, the heating of the negative tip is comparatively small.

But when the electrons arrive at the positive carbon they encounter an obstacle to their carefree flight. The positive carbon, although quite hot by ordinary standards, is several thousand degrees cooler than the arc-stream. The coolness of the carbon overlays the crater floor with a thin film of relatively cool carbon gas. This film is called the *anode layer.*

The hotter a gas the better it conducts electricity; so, as we might expect, the anode layer offers great resistance to the electrons passing over from the *negative* carbon. They are slowed down at once by the anode layer, and they get all hot and bothered about it, transferring much of their kinetic energy to the crater floor as *heat energy.*

Temperature of the Crater Floor

So much energy is transferred from the electrons to the positive crater that the temperature of the crater floor goes up to the boiling point of carbon (6,633 degrees F. or 3,670 degrees C.). Yes, the carbon in the crater floor actually boils away as gas; and the layer of boiling carbon, from which comes 90% of the light of a low-intensity arc, is extremely thin.

But why isn't the arc-stream brighter than the positive crater? It's hotter, isn't it? The arc-stream has a higher temperature, to be sure, but the crater has more *heat energy measured as calories.* The positive carbon is solid —dense, with millions of multi-billions of atoms tightly packed together. The arc-stream is gaseous—tenuous, thin, ethereal, with atomic world-systems separated by wide-open spaces of *terrifying nothingness!*

Gases (unless loaded with dust particles) must be heated to millions of degrees before they get very bright. Not so with liquids and solids. It is the hot solid carbon of the positive

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The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.

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crater that furnishes most of the light. The moment the carbon boils away, it becomes part of the arc-stream—hotter, but *less luminous.*

Put into electrical terms, the story is more easily told. Just as there is a small voltage-drop between the tip of the negative carbon and the arc-stream, and another small voltage-drop from one end of the arc-stream to the other, there is a *comparatively great* voltage-drop between the arc-stream and the positive crater. This great drop is due to the anode layer of cool carbon gas of high electrical resistance lying over the crater floor. When current (amperage) is forced through a resistance by electromotive pressure (voltage), that resistance gets hot.

As a specific illustration, consider a low-intensity arc operating on 60 volts. This is a way of saying that there exists a 60-volt voltage-drop between the two carbons as measured by a voltmeter. Now, the total 60-volt drop is divided as follows: 5 volts between negative tip and the beginning of the arc-stream; 15 volts between both ends of the arc stream, and 40 volts between the end of the arc-stream and the positive crater.

Physical Character of Arc-Stream

It might seem as if the arc-stream, the hottest region of an electric arc, should have the greatest voltage-drop. As stated previously, the total *amount* of heat (calories, *not* degrees) is greatest in the positive crater. Then, too, the arc-stream actually gets much of its heat from the anode-layer drop. Energy is absorbed when the carbon changes from a *solid* to a *gas,* and the gas burns in the arc-stream, releasing its absorbed energy. This is a complex and interesting process.

No less interesting are the electrical properties of the arc-stream. Most solids that conduct electricity, such as wire, offer more resistance to the passage of current as they get hotter. But the arc-stream, like all other gaseous conductors, offers *less* resistance as its temperature goes *up.* The arc-stream makes a fool of Ohm's law.

Ohm's law is a rule involving three factors: current in amperes, electromotive force in volts, and resistance in ohms. When we know *any two* of these three factors in a circuit, we can find the third by using a simple formula which exists in three forms:

Amperes = Volts divided by Ohms.
Volts = Amperes multiplied by Ohms.
Ohms = Volts divided by Amperes.

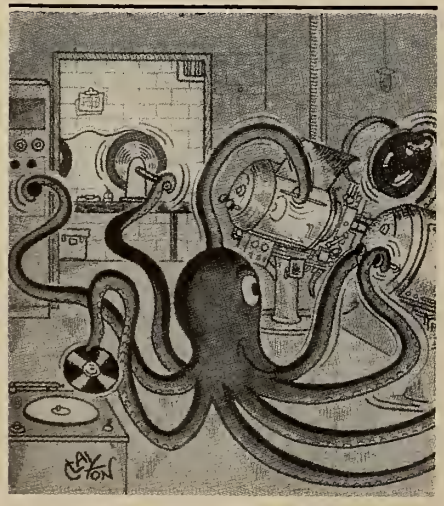
Ohm's Law Not Applicable

The Ohmic formula, so handy in ordinary electrical problems, does *not* work with gaseous discharges such as the arc-stream. An arc-stream can get denser, fatter, and hotter, and hence more conductive—things that no solid conductor can do. So, we see, the arc-stream does not *limit* the amount of current flowing in a circuit as ordinary resistances do.

Feed more current to an arc, and the resistance decreases. With lower resistance, more current flows. And this decreases the resistance still more, allowing still more current to flow. The arc runs wild, the resistance decreasing and the current increasing, until the generator burns up or a fuse blows.

This is why a current-limiting device such as a ballast rheostat *must* be used to keep an arc under control. Without something of this sort to restrain it, the most mild-mannered arc becomes a raging, flaming short-circuit. Most rectifiers have choke coils or transformers on the A.C. side which function like the ballast rheostats used with motor generators.

A ballast rheostat necessarily consumes current and delivers a voltage at the arc somewhat lower than the voltage at the generator terminals. A low-intensity arc operated on 60 volts ordinarily requires a 20-volt drop in the ballast rheostat for smooth, stable operation. The generator, accordingly, must deliver 80 volts. (The ballast is connected *in series* with the arc.)



Universal acceptance of the IP thesis, expressed in a recent editorial, that the new processes require a hydra-handed projectianist is indicated by this illustratian, intended to be humaraus but in reality in a mast serious vein, culled fram the current issue of "Ideal Kinema," British technical jaurnal.

If the generator be located in the cellar of the theatre or at some other point at quite a distance from the projection room, "line drop"—the resistance of the wires from the cellar to the projection room—may be substantial. Line-drop should be regarded as part of the ballast drop; so if the line drop be 2 volts, the ballast drop need be only 18 volts in the case of the 60-volt low-intensity arc. But in any case, the generator must furnish a potential of 80 volts for the 60-volt L.I. arc.

The earliest carbons were "solid," that is to say, they were *hard carbon all the way through.* When solid positive carbons are used, the arc "wanders" irregularly around the end of the carbon, continually searching for the path of least resistance which it never seems to find—quite like Diogenes looking for an honest man. The light accordingly, flickers, making the arc unsuitable for motion picture projection.

In order to stabilize the arc, "cored" carbons came into use. A hole is formed longitudinally through the axis of the carbon during manufacture, and this hole is subsequently filled with softer powered carbon mixed with potassium salts which steady the arc.

Reason for the Cored Positive

Cored positives are always used in motion-picture projection. The core mixture turns to vapor more readily than the hard carbon shell, thus establishing a good arc at a lower voltage than that required for a solid carbon. The vaporized potassium salts increase the electrical conductivity of the arc-stream, insuring that the electrons rushing across the gap from the tip of the negative will land plumb in the center of the positive and form a symmetrical crater of proper depth *right there.*

The positive carbon of an arclamp "trim" is consumed about twice as fast as the negative when both carbons have the same composition and the same diameter. By using a positive larger in diameter than the negative, the rates of consumption can be made nearly equal. This expedient also minimizes the shading of the luminous positive crater by the tip of the negative, thus increasing the amount of

(Continued on page 30)

1954: Decisive Year for Film Industry

By JAMES MORRIS

During 1954 many needless fears were quieted, and the industry began to look ahead to future triumphs rather than backward on past glory. Also, much was accomplished in standardizing the new techniques for film projection.

IF ONE were to select a single word that would sum up the attitude of most of the people in the motion picture exhibition field in the first month of 1955, that word would be *confidence*. Last year, at the beginning of 1954, the outlook was much different. The air was filled with the frenzied cries of those who predicted that thousands of theatres would succumb to the competition of the home Tv set. In addition, the new projection processes were often misused by both producers and exhibitors in a desperate effort to hold on to what was felt to be a steadily diminishing movie audience.

There are two outstanding reasons for the renewal of confidence in the future of the motion picture theatre.

Drive-Ins Took Up Slack

First, it has been established that the figures on wholesale closings of theatres are misleading. Thousands of theatres have been forced to close since the war—yes. But thousands more have opened. The booming drive-in business has taken up the slack. The number of "seats" in both automobiles at drive-ins and indoor theatres is now greater than in 1946, an all-time peak year for the industry.

If this gain could occur during a period of confusion and despair, it follows logically that much more can be accomplished by a sound and consistent plan to maintain public interest. The business is not on its last legs—far from it.

The second reason for renewed confidence is that during 1954 much progress was made toward standardizing the new projection processes. In the beginning, some of the claims were so confusing and frantic that the impression was given that many of the promoters did not really believe their own statements. Now most of the chaff has been separated from the wheat.

One of the new ideas—the use of a large, wide screen—has definitely proven its worth as a means of giving films a new look and attracting customers to theatres. Another, 3-D, proved to be little more than a temporary "gimmick" in its present state of technical development, and has been discarded for the moment at least.

Credit for better business during 1954 is attributed to improved projection techniques and to better pictures—pictures that attracted audiences by better story value, photography and direction.

The Small Exhibitor

All-around improvement in both presentation and production brought new customers into the theatre, but in the complicated exhibition industry it also created problems. Exhibitors, who previously complained that they were being overloaded with junk, became bitter over the fact that Hollywood was trying to concentrate on fewer but "bigger" pictures instead of a large total output.

The smaller exhibitors, particularly those running neighborhood houses, were quick to discover that their existence was jeopardized by a production system that did not provide them with enough product for frequent program changes. They found that their theatres were supported, to a large extent, by habitual moviegoers who attended often provided a new picture was playing.

If the exhibition industry is closely examined at this moment, it will be found that the small neighborhood theatre is in the weakest position. The owner has great difficulty getting the product he needs, and he is hard hit by competition not only from the home Tv set but from within the industry itself. The new drive-in audience, for instance, must come from somewhere, and it is safe to say that a portion is made up of people who formerly patronized a neighborhood theatre. While the first-run houses and drive-ins are making money and solving most of their problems, many small exhibitors find themselves with their backs to the wall.

This situation is behind the agitation of exhibitor groups during the past year to form a pool for the financing of more pictures from Hollywood. It is also behind the current efforts to promote foreign films. The small exhibitor feels, and probably rightly, that he cannot survive on a diet of a few high-quality pictures.

Technical Developments

Of great interest to projectionists are the technical developments of 1954. After the heated enthusiasm and confusion of 1953, much was accomplished in further developing the new



The giant screen erected last year at the Mator Vu drive-in, Salt Lake City, is an example of the radical changes now going on in film presentation. This screen, 102 feet wide and 48 feet high, is designed for CinemaScope. Filling it with an acceptable picture is a formidable task.

projection techniques and a good start was made in arriving at standards which would make possible the showing of all pictures in all theatres and also protect the investments made by purchasers of projection and sound equipment.

3-D, as mentioned earlier in this article, fell flat on its face at the boxoffice early in 1954. Despite tremendous publicity efforts, this form of presentation could not survive in the face of difficult projection problems and the attitude of producers who used it in an unsuccessful attempt to make platable some of the dullest and most tasteless pictures that Hollywood ever turned out.

On the brighter side, it may now be stated without fear of contradiction that the big, wide screen is here to stay. There are still many arguments, however, as to whether it should be flat or curved, white or metallic-surfaced, and whether the aspect ratio should be 1.75, 2 or 2.5 to 1. Also, both anamorphic and standard wide-angle lenses are being used to obtain the wide pictures.

Stereosound Widely Accepted

Becoming more and more widely accepted but not yet as entrenched as the big screen are stereophonic sound systems. Not so obvious a drawing card as the big screen, stereosound has been resisted as too expensive by many small exhibitors trying to cope with losses at the boxoffice.

However, as 1954 progressed most of these complaints were quieted. Doubting exhibitors came to the realization that theatres could no longer prosper unless they offered the very best in both screen image and sound. Expenditures for new amplifiers, speakers and magnetic pick-ups came to be regarded as investments in the future even if the initial payments hurt.



The variable anamorphic lens, a surprisingly simple device for unsqueezing anamorphic prints, was put into production last year by a number of different firms. These lenses accomplish their purpose by means of two adjustable prismatic wedges. The lens shown above is the Hilux, made by Projection Optics.

Also, another stereosound system, Perspecta, was developed by Fine Sound, Inc., of New York City. This system works by means of one cued optical track that can be reproduced over either a triple-channel stereosound system or the older single-channel amplifying and speaker system. To further ease the sound reproduction problems of small exhibitors, 20th Century-Fox announced early in the year that it would provide single-track optical sound prints of CinemaScope pictures to theatres desiring them.

Advent of VistaVision

One of the most noteworthy technical events of the year was the advent of the VistaVision process under the sponsorship of Paramount Pictures. Basically a camera process that provides a superior projection print without requiring any change in the projector itself, the VistaVision print is capable of providing a screen image of great detail and little graininess even under the largest magnification.

As all IP readers now know, VistaVision is simply a means of photographing a picture with a camera having a horizontal film path and exposing a frame more than twice the standard size. This larger negative is reduced to standard size by an optical printing process that retains practically all of the increased detail gained from the larger negative.

For unusual projection conditions in large theatres where screens of fifty-feet width and over are used there is also a special VistaVision projector with a horizontal film path that projects a double-size frame, providing more light and still greater image definition. This projector is being manufactured by the Century Projector Corp. and was described in the October issue of IP.

Trend Toward "Roadshow"

Another interesting development of 1954 were the plans for limited and "roadshow" exhibition of certain pictures with projection equipment that would produce approximately the same results as the horizontal VistaVision projector. These plans were at least partly inspired by the continuing success of Cinerama which has a somewhat similar exhibition policy.



The fastest American projection lens is the Kollmorgen f/1.7, which made its debut late last year. Designed to help solve the often critical light problems of wide screen projection, it considerably increases the amount of available light transmitted to the screen.

The Todd AO production of "Oklahoma," which was filmed with special large-negative, wide-angle cameras, will be presented on a limited basis in a few theatres where projectors for 65-mm film and special stage and screen masking equipment will be installed. Todd AO is an example of the roadshow trend. In addition, 20th Century-Fox is working on the idea of making 65- or 70-mm prints of CinemaScope productions for special first-run showings. The Cinerama people also have additional plans. They plan to widen the distribution of their show by building a portable three-projector unit that will fit in one projection room and make it possible to present Cinerama in a great many theatres with only minor temporary alterations.

An important technical development was the recent announcement by the International Projector Corp. that it can now supply a modified version of its latest Simplex projector that incorporates a water-cooled aperture and an air blast cooling system for the film. Use of high-powered arclamps for filling big screens makes this additional cooling equipment necessary, it was said. Another projector manufacturer, Motiograph, reports that production will begin shortly on a new projector designed to increase the efficiency of wide-screen projection.

During 1954, lens manufacturers produced new high-speed, wide-angle units designed to transmit the largest

(Continued on page 29)

Notes on Exhibition In Foreign Lands

By DR. JOHN G. FRAYNE

Westrex Corporation

DURING a recent round-the-world trip, the writer had the rare opportunity of visiting a great number of theatres scattered throughout the major cities of the world representing diverse races, languages and cultures, and under a wide range of climatic conditions. One common denominator was the universal interest in America motion pictures.

New theatres were being built all over the Orient, many of the ornate type reminiscent of those erected in America during the plush 20's. The local architects are, however, incorporating the latest ideas in acoustic treatment of walls and ceilings. The most modern indirect auditorium lighting is usually installed and provision is made for larger proscenium arches to accommodate the widest possible screens. Comfortable seating facilities are prevalent.

Much Interest in CinemaScope

The CinemaScope era had just dawned about the time this trip was first planned, and initial runs of pictures like "The Robe," "Command" and "Khyber Rifles" had taken place before my visit in many countries. The reaction abroad was very favorable; and theatre managers with whom I talked attributed the success of these pictures, in part, to such technical features as the wider screen, excellent color, and stereophonic sound.

At the present time there are additional CinemaScope completions in Japan, in which country there were ten very early CinemaScope installations. In Hong Kong, Manila, Singapore and Djakarta (Indonesia) a number of theatres were similarly equipped. India had about 20 installations. In European countries, such as Italy and France, the reception of CinemaScope pictures was very favorable.



Some foreign theatres are gigantic in size and provided with the finest projection and sound equipment. Above is the Gaumont Palace Theatre in Paris, which stands in the first rank among the world's film theatres.

Foreign Technicians Well Trained

One item that might surprise an American engineer on a tour of this nature is the wide dissemination of technical information about current and proposed film projection techniques and the high educational level of responsible officials in theatre supply companies, service organizations and theatre chains. Highly efficient theatre service organizations, staffed by competent local engineers equipped with modern test equipment, are found everywhere.

Conversation with these people is much the same as with their counterparts in America. Covered are such subjects as the relative merits of anamorphic *vs.* widescreen, stereophonic *vs.* monaural sound, auditorium speakers *vs.* none, and the relative merits of American *vs.* Continental projectors. In short, the technical groups in every country visited are wide-awake and completely up-to-date in their knowledge of the latest equipment and techniques.

In the design of theatres, it is my opinion that foreign technicians are somewhat ahead of their American colleagues. For instance, one theatre in Manila employs an acoustic design found only there *and* at the United Nations Assembly Hall in New York. In Dublin (Eire) we find the first theatre in the world built specifically for CinemaScope screen and sound, as far as sight lines are concerned. Another interesting feature of most foreign houses is the incorporation of snack bars and tea rooms in the theatre building, which seem to attract customers and make the theatre a social as well as amusement center.

Reproducing Sound Methods Overseas

Many different methods are used to present the dialogue and sound of American pictures throughout the world. In the Orient and in India, printed titles are generally used; while in Europe local dubbed versions are generally employed. English language versions are confined almost entirely to Great Britain and British Commonwealth countries, a few English-speaking countries such as Eire, and a few metropolitan centers. In Singapore the writer saw a projectionist following the dialogue with homemade lantern slides, a practice I am told is quite common in the more backward areas.

On the whole, there is no depression in foreign motion picture theatre business. Houses seemed to be filled almost everywhere, a factor which inspires exhibitors to invest in really striking and elaborate theatres. A good example is the Avenue Theatre in Manila, which is combined with an hotel eight stories high. The theatre's spacious lobby occupies one-half of the ground floor of the hotel building. The wall of the foyer facing the staircases is covered with a big mural. The theatre auditorium is built behind the hotel and seats 1560 people with ample standing space in both the balcony and the orchestra for at least 500 more.

Projection room equipment includes a Westrex Master photographic sound system with dual-channel 100-watt amplifiers and a 3-projector installation. A stereophonic

Film Damage on the Increase

By HENRY B. SELLWOOD

FILM damage is on the increase. Complaints from projectionists concentrate on the prevalence of "rain," a defect consisting of innumerable lengthwise scratches on the film. The exchanges gripe about projectionist "mishandling" of prints; projectionists blame the exchanges. It seems to us that the exchanges have failed to track down the ultimate causes of film damage.

The present-day shortage of prints is in large part phony. There is no shortage of positive raw stock. Very often fresh prints of current pictures repose unused in the vaults while badly mutilated prints of the *same pictures* are sent out again and again. The best repair work on some of these prints is done, not by the exchanges but by projectionists.

Written Complaints of No Avail

Any competent projectionist knows when a print is in unrunable condition; and instead of doing the exchange's work for free, he should throw such a print back where it came from. This is ordinarily the only way to remedy an intolerable situation: written complaints enclosed in the film cases apparently aren't even read.

There are plenty of inexperienced and incompetent "operators," many of whom are *under-aged* and underequipped with brains, who treat the prints very roughly—prints that come to you and me sooner or later. If the kids work cheaply enough, the backwoods exhibitors don't give a damn. Not even when a film exchange presents them with a whopper of a bill for wrecked footage. They blame the damage on someone else.

It is unfortunate that the fellows who pepper the last 25 feet of each reel with those screen-filling X's, O's, and other homemade cue-marks are often the first ones to get a crack at the brand-new prints. Most of us don't like to break in a "green" print: the freshly waxed film may "stick," running noisily and depositing wax and emulsion all over the gates.

So what do the exchanges do? They book pre-release and first runs in the Rosebud Theatre over the feed store in Belching Corners to get the "green" prints broken in. But the vintage Powers projectors and junk soundheads in the Rosebud chew the film up as well as break it in.

Obsolete Equipment Still With Us

Another unfortunate thing is the obsolete and wornout equipment that many conscientious and skilled projectionists have to operate. All too many exhibitors are willing to appropriate thousands for the lobby, but not one penny for the projection room. Good projectionists, however, by keeping the projectors properly adjusted and clean, and by insisting on frequent sprocket replacements, can minimize the damage which antique equipment inflicts on film.

But in certain cases brand new projection and sound equipment devastate untold miles of film. We refer specifically to CinemaScope 4-track stereophonic sound reproducers. The damage which these magnetic soundheads inflict on CinemaScope film is one thing: the scratching of regular optical-track prints by these heads is another.

Magnetic-track CinemaScope prints must run in a tight loop over the various rollers of the penthouse soundhead and rub against the magnetic pickup. This is punishment for any film; and the use of narrow sprocket teeth also helps to shorten the life of 4-track CinemaScope prints.

Film Path Contingencies

When regular optical-track prints are shown, the film is threaded directly from the upper-magazine fire rollers to the upper feed sprocket of the projector mechanism, by-passing the numerous weighted rollers of the magnetic compartment. To prevent the film from scraping against the edges of the holes in the top and bottom of the penthouse reproducer, however, it is threaded over and under one or two of the reproducer guide rollers.

Serious trouble arises when the roller arrangement of the magnetic reproducer is not adapted to either the type of magazine fire valve or the make and model of projector mechanism used. In such a case film that is threaded to by-pass the magnetic reproducing gear may actually rub against the edges of the openings in the bottom of the magazine fire-valve, the top of the magnetic soundhead, the bottom of the magnetic soundhead or the top of the projector mechanism.

An Important Simplex Part

A case in point is provided by the Simplex X-L magnetic soundhead when used with the regular-type Simplex magazine fire valve box and the

(Continued on page 28)

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sound system was recently added using 3 Westrex R9 Reproducers, 3-stage speaker systems and 14 auditorium speakers.

Technical innovations in motion pictures duriing the past two years have made a very deep impression on technicians and exhibitors throughout the world. Directions for presenting pictures filmed in the new processes are usually followed exactly. Where CinemaScope is installed, for instance, the recommended 2.55 to 1 screen ration is generally maintained in spite of screen widths as small as 32 feet.

The Gaumont Palace in Paris is an ideal example of the lengths which many European exhibitors have gone in adapting themselves to the new processes. With a seating capacity of 5500, this is one of the largest theatres in the world. In addition to a 73-foot by 44-foot Raytone screen and a Westrex stereophonic sound system, the Gaumont is now equipped with super-power lamps using blowers and heat deflectors. Four 125-ampere motor generator sets are used.

The Queens Theatre, perhaps the most popular theatre in Hong Kong was recently converted to accommodate a 42-foot CinemaScope picture. Here, the Astrolite screen was mounted flat, but still gave a good light distribution throughout the whole seating area of the theatre. Other equipment now includes Century water-cooled projectors and super-power arc lamps.

From Toy to a Great Industry

III. THE LIVING PICTURE. The concluding article of three in which are detailed the development of the motion picture from its inception down to the present. Originally appearing in "Movie Makers" magazine, these articles attracted widespread industry interest and acclaim as a vital contribution to the literature.

By JACK E. GIECK

MANY "inventors" were in the act by this time, and it is difficult to assign credit accurately. But an important pioneer of the era was a U.S. Treasury stenographer, C. Francis Jenkins.

One of Jenkin's early "Phantoscope" cameras is shown schematically in Fig. 11. The film moved continuously in this camera. Lenses mounted on the large opaque wheel moved by the aperture tangentially, each one traveling with the film for a short distance as it passed by.

A home viewer marketed by Jenkins between 1894 and 1896 is shown in Fig. 12. Also called a Phantoscope, this viewer contained several hundred individual frames printed on small cards, which were mechanically flipped when the crank was turned. The sequence in this machine includes a performance by a troupe of circus elephants.

1895—Lumiere's Cinematographe

The first commercially successful projector appeared in France in 1895. It was Louis Lumiere's "Cinematographe," the first machine to employ a practical *intermittent* movement. Lumiere's projector, and the camera he also built, both had cam-operated, pull-down claws similar to those used in most amateur cameras and projectors today.

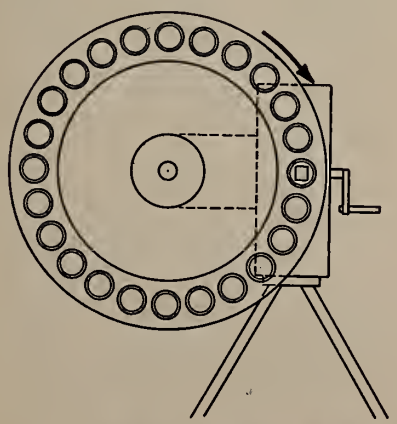


FIG. 11. Phantoscope camera, designed by C. Francis Jenkins, moved lenses and film.

The condenser lens in the projector absorbed arc heat in the same manner that the original Jenkins machine had. Both employed round-bottom chemist's flasks filled with water to converge the light on the film. When the water began to boil, the optical properties of this lens left something to be desired.

The Edison Kinetoscope projector, patented in this country in 1897, is shown in Fig. 13. This machine featured intermittent beater-movement sprockets to transport the film past the aperture. The electric arc lamphouse is obviously a converted magic lantern.

Figure 14 is the "Biographet" projector brought out by Edison in 1898 and manufactured by the American Mutoscope Corp. In an attempt to improve on the jerky beater sprockets, this projector employed continuous film movement, utilizing a rotating glass prism in conjunction with a tracking spiral shutter to scan the film as it went by. This principle (minus the shutter) is now employed in the Western Electric Fastax camera which takes high-speed movies up to 14,000 frames per second. Fig. 15 is an experimental Edison projector employing one of the first Geneva movements, which movement ultimately became the industry standard.

First Home Movie Projector

In 1897, Edison also brought out the first home movie projector (Fig. 16). This unique machine used a picture film sold by the manufacturer (there were no home movie cameras) which was approximately 32-mm wide and bore *three* parallel tracks of images. The frame size was about the same as present-day 8-mm film



FIG. 12. Jenkins's Phantoscope viewer moved hundreds of small cards as in a flip-book.

(3.51-mm x 4.80-mm) and the projector aperture was adjustable.

When the picture was started, only the left 1/3 of the aperture slot was open. The film was cranked through the machine until the upper reel was nearly empty, then the aperture was racked over to the middle position, the projector re-aimed at the screen, and the machine was then cranked *backwards* until the upper reel was full again—the frame order being reversed on the center track.

Finally, the aperture was moved over to the extreme right position and the show continued with the projector operating forward again. Some fun!

The extra projection lens on the front of this machine was to accommodate lantern slides. Dual lenses were common on early theatre projectors for the same purpose.

Even though intended for home use, the projector employed a carbon arc



FIG. 13. Edison's Kinetoscope, patented in 1897, used electric arc lamphouse from a magic lantern.

for illumination. This was the most desirable illuminant available on early projectors, but it was not the only one used. The limelight, mentioned last month, was popular in nickelodeons. The mercury arc also was used to a limited extent, but its blue-green color left much to be desired. Incandescent lamps were subject to filament damage rather easily and were not very bright.

They were not as dim as the kerosene lamp used in the toy projector shown in Fig. 17 however. This little machine was the very essence of frugality: it had neither a condenser lens, shutter, nor even a takeup reel, though it did boast a Maltese cross movement. With such inefficient illumination, its screen image could not have been much bigger than a postage stamp.

Sun as Light Source

Better models of oil lamp projectors featured multiple wicks in tandem. And the best had Welsbach mantles. But many home movie enthusiasts preferred *sunlight,* piped into the projector through a system of mirrors which followed the sun by means of a clock movement!

Another peculiar home movie machine which appeared early in the 20th century was the "Spiragraph," which used discs of film about 10 inches in diameter. These platters were mounted vertically on the front of the projector; another model employed a cylinder of film which completely surrounded the projector. The frames were printed on these films in the form of a spiral, and the lens dropped slowly as the picture progressed.

Synchronized sound made its bow early — about 1898 — through Thomas Edison's efforts. The sound was recorded on phonograph discs, which were driven off a shaft coupled to the projector. Mechanical recording being what it was, the actors' voices could not be picked up at a distance. So it was common practice for the principals in the cast to group themselves around a gramophone recorder before a "take" and shout their lines into the horn. Then, while the record was being played back, they would act out their parts before the camera, silently mouthing their lines in synchrony with the recording.

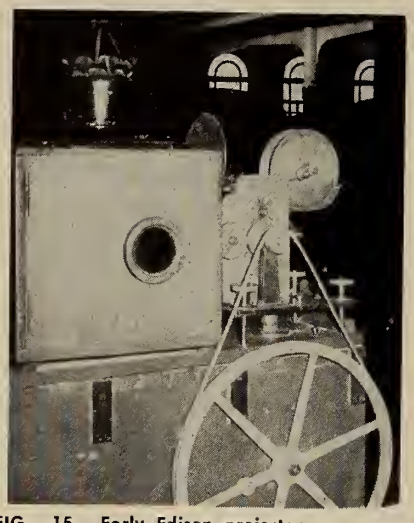


FIG. 15. Eorly Edison projector wos omong first to use now-stondord Genevo movement.

The quality and volume of the sound reproduction were so poor, however, that mechanical records never received much favor. A more popular system, in some cities, involved supplementing the piano player or house orchestra with a sound effects man behind the screen. Some theatres even experimented with a small staff of actors who read dialog aloud behind the screen.

1912—First Optical Sound

The first optical sound tracks appeared in 1912. They were produced on the film by modulating a small carbon arc by means of sound waves, using a technique similar to the "singing flame" apparatus used by physicists of that day. This sound was played back electrically through three loudspeaking telephones behind the screen (the projector sound head consisted of a carbon arc and a selenium photocell). It was up to the projectionist to watch the screen and flip switches to direct the sound to the proper speaker, thus simulating stereophonic sound.

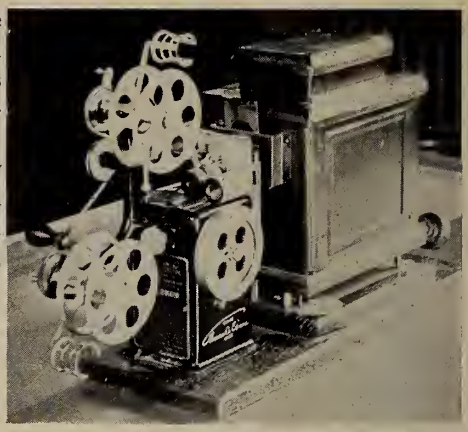


FIG. 16. This wos home movies o lo Edison in 1897! The film, with three rows of imoges, was 32-mm.

Color Came First by Hand

Color movies were also fairly common at this time. Hand-staining individual copies of a film had given way to hand-tinting a master matrix, frame by frame, with a transfer dye, which was then printed onto the individual copies for distribution.

It was still an enormously tedious process; a more popular system involved a technique similar to the field-sequential television process formerly

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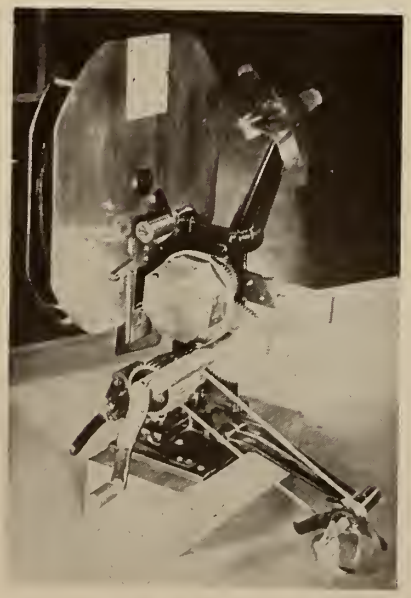


FIG. 14. Design principles used in Edison Biogrophet (1898) ore being re-used todoy in Western Electric's Fastox speed camero.

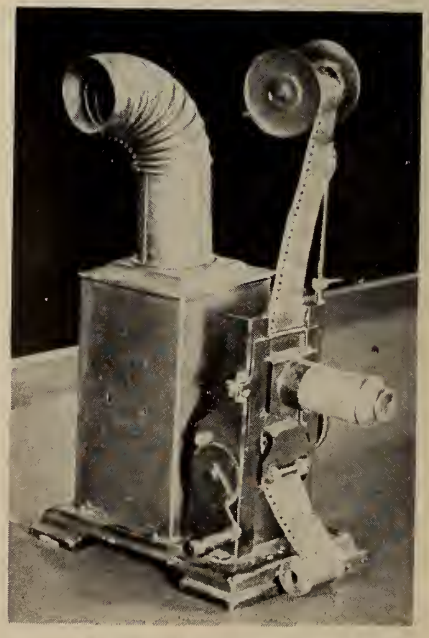


FIG. 17. A kerosene lomp wos the illuminont in this tiny toy projector.

LETTERS TO THE EDITOR

Magnetic vs. Optical Sound

To the Editor of IP:

In your August issue, you stated in reply to Harold Goldstein that projectionists and sound engineers can "*easily* get 10,000 cycles of undistorted signal from either the 1 or 1¼ mil scanning beams, which is 1000 to 2000 cycles higher than modern theatre speakers are designed to reproduce."

Take a look on page 32 of the same issue and you will notice that your "modern" speakers are no longer "top-notch high fidelity equipment." I believe Ampex is the second to announce hi-fi speakers for magnetic sound, Altec being the first. So you fellows better get new speakers along with penthouse reproducers.

Also, any secret you have for getting 10,000 cycles undistorted signal from an optical reproducer. I'll buy. Let's investigate the 1-mil. scanning beam with its higher frequency reproduction and higher noise levels:

Film passes this beam at the rate of 18 inches per second, which is equivalent to 18,000 1-mil lengths or sections per second. To reproduce one cycle the film must go from clear to opaque in a sine wave pattern. This takes 2 mils if the photo cell is to see and reproduce this pattern faithfully. So, 18,000-mil lengths per second divided by 2 mils per cycle gives 9,000 cycles for undistorted signal. I would also question the fidelity of this 9,000 cycle signal. So how about passing along the secret. I would like 10,000 cycle undistorted optical sound for my hi-fi speakers designed to reproduce the full range of magnetic sound.

ROBERT ZILLER

Billings, Montana

Frequency Range and "Quality" Repro

ANY optical soundhead—even an inexpensive early model which has been resurrected from the trash heap—very readily responds to 10,000 cycles per second when this frequency is recorded in the soundtrack and the optical tube is in reasonably good focus. Moreover, optical attenuation at 10,000 cycles is not excessive, the response at this frequency being 60% of maximum when the 1-mil scanning beam is used, and 40% with the preferred 1¼-mil beam.

There is no photocell lag at all when vacuum-type phototubes are used. These respond *instantly* even to millions of variations per second. The output of conventional gas-filled photocells, however, is approximately 70% of maximum at 10,000 cycles, resulting in a total response of 42% of maximum with 1-mil scanning, and 28% of maximum with 1¼-mil scanning.

Selectivity With Optical Track

Although this attenuation at 10,000 cycles can be compensated for in the amplifier circuits to provide a level system response, most engineers, as well as most listeners, prefer a "droop" at the high end of the response characteristic.

You may have the droop or not with optical-track reproduction (the choice is yours) but with the CinemaScope type of magnetic reproduction, such a choice does not exist. In CinemaScope magnetic sound the droop normally begins somewhere between 4000 and 5000 cycles and progressively creeps down toward the low-frequency end of the sound spectrum *as the magnetic heads wear and the soundtracks demagnetize themselves.*

Mr. Ziller appears to have doubts as to the highest frequencies reproducable optically. The high-frequency limit is found by dividing the rate of film-travel in inches (18) by the thickness of the scanning beam (0.001 for the 1-mil beam; 0.00125 for the 1¼-mil beam). Thus we know that 18,000 cycles is the cut-off frequency in 1-mil scanning, and 14,400 cycles in 1¼-mil scanning. Response is sufficiently strong to about 15,000 cycles in the first case; and to about 12,000 cycles in the second.

"Naturalness" Prime Factor

Especially to be noted is that design engineers of sound apparatus strive for factors *other than high cut-off frequencies* to attain perfect naturalness in sound reproduction. Uniform film speed, the absence of frequency and harmonic distortions, and the absence of intermodulation effects, for example, are far more important than attaining frequencies so high that hardly anyone *(if anyone)* can hear them.

To inject a personal note, the writer can hear nothing above 15,000 cycles, and he can hear 10,000 cycles only with difficulty as a faint whistling hiss. Perhaps the average listener can hear higher tones; but to nobody does any frequency higher than 9000 or 10,000 cycles provide appreciable "tone coloring" to sounds in either real life or motion pictures. "Hi-fi" is *not* synonymous with high frequency!

Frequency-Range Detection

The importance of extremely high-frequency response has been horribly oversold to the projection craft by the proponents of magnetic recording—the very people who really have the least to brag about in this direction.

Perhaps Mr. Ziller does not truly appreciate how little difference there is between 9- and 10,000 cycle sounds (not quite two semi-tones of the equitempered scale), or how extremely high in pitch these tones are. As an example, the highest tone on the Hammond electric organ, obtained by pulling out the last white drawbar (setting 00 0000 008) and pressing the last key at the right-hand end of the keyboard, is between 6- and 7000 cycles.

As another example, the highest note of the piccolo—the highest-pitched instrument of the flute family—has a fundamental frequency of 4752 cycles, with a faint "third harmonic" of 15,840 cycles *which is quite inaudible at this pitch.*

A sound reproducing system, therefore, need not go beyond 5000 cycles to produce faithfully the piccolo's highest note.

Why question the "fidelity" of a 9- or 10,000-cycle tone when the first overtone (second harmonic) of so high a fundamental is 18- or 20,000 cycles? What kind of sound system could possibly reproduce it, or, if reproduced, who could hear it?

Tones higher than 6- or 7000 cycles lose all timbre, or "tone quality." The nearest thing to an exception that we can think of is the peculiar tone

(Continued on page 26)


The sword



that pierces your heart . . . almost

Here make-believe gives tough battle to reality—virtually overcomes it for the duration of the show.

Size has much to do with this conquest. The wide, wide screen fills the eye from full left to full right—concentrates attention. At the same time, a sense of encircling nearness reaches out and engulfs the audience—makes it "one" with the action.

There are problems of production, processing, and projection with this new technic. They are present whether the film presented is black-and-white or color. Many of them have been solved by the motion picture industry with the help of the Eastman Technical Service for Motion Picture Film. Branches at strategic centers. Inquiries invited.

Address: Motion Picture Film Department

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

East Coast Division
342 Madison Avenue
New York 17, N. Y.

West Coast Division
6706 Santa Monica Blvd.
Hollywood 38, California

Midwest Division
137 North Wabash Avenue
Chicago 2, Illinois





The sword that pierces your heart . . . almost

Here moke-believe gives tough bottle to reolity—virtuolly overcomes it for the durotion of the show.

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In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

THE IATSE and ten major motion picture distributors have agreed on a two-year contract covering all employes in the "F" and "B" Exchange Locals in the United States. The new contract, which runs to November 30, 1956, calls for an increase of $5.50 per week per employe, retroactive to December 1, 1954, and for a reduction of the work week from 40 to 37½ hours, dating from January 3, 1955.

Decision to hold nation-wide talks was made following a poll in which the Locals of both back-room and front-office employes voted overwhelmingly against negotiating in each exchange area.

Representing the IA in the negotiations were Harland Holmden, General secretary-treasurer; Louise Wright, IA vice-president, and Joseph D. Basson, IA representative. President Richard F. Walsh participated in the final sessions. The distributors' committee consisted of representatives from Loew's, Inc.; 20th Century-Fox, Paramount, Universal, Warner Bros., National Screen Service, Republic Pictures, Columbia, United Artists, and RKO.

• Hugh W. Usher was recently re-elected to his third term as business representative of Local 303, Hamilton, Ont., Canada. Usher was first elected to this office when Hugh J. Sedgwick, former business representative, resigned to assume his new duties as IA representative in Canada.

• At a recent election, the following members were chosen to serve on the board of directors of the Local 150 Club, Inc., (Los Angeles): Albert R. Adams, Harold Angel, H. Clay Blanchett, Wallace G. Crowley, Ralph MacDonald, Paul J. Mahoney, Magnus Nielsen, Clyde W. Shuey, Hugh C. Smith, Leo F. Stockwell, Charles A. Vencill. *all incumbents*, and J. H. "Red" McDonald.

• Members of the Exchange Locals in Cleveland enjoyed their first Christmas and New Year holidays, in accordance with the recently concluded contract between the IA and the major distributing companies.

• Recalling the early days of motion picture entertainment seems to be a favorite pastime of many old-timers in the craft. In a reminiscent mood during a recent visit to the offices of IP, Morris J. Rotker, long-time projectionist and member of New York City Local 306, recalled those early days when motion pictures were considered freak attractions and were usually shown in vacant stores.



Morris J. Rotker, member New York Local 306

"The first movie theatre in which I was employed," said Rotker, "was a vacant store at 9 Bowery, New York City. Not only did I have to grind the projector but I also had to operate a "talking" machine which had a horn out on the street for the purpose of collecting a crowd in front of the store. At that time it was pretty tough to get the people to come in to see a movie, and all kinds of tricks were employed to get them inside the so-called playhouse.

"For instance, there were two empty windows in the Bowery store where I worked, in one of which a Chinese, dressed like a mandarin, would set up an easel and go through the motions of painting a landscape, or whatever caught his fancy. When a large crowd collected in front of the window the Chinese at a given signal, would take up his painting parapher-

MOVIE SOCIAL CLUB OF BROOKLYN (L. 306) HONORS MEMBERS



Jacob S. Winick, extreme left front row, and Harry Garfman, extreme right, are pictured here receiving gold life membership cards in the Movie Social Club of Brooklyn for their outstanding work in providing free entertainment for patients in various Brooklyn hospitals. Frank Grill, second from left, is shown presenting the award to Winick; Irving Meltzer, second from right, presents gold card to Garfman. Witnessing the presentations are, back row, left to right: Izzy Sillman, Harry Weinberg, and Irving Schlesinger.

nalia and disappear into the store. Then the barker—a smoothie—resplendent in a high hat and with a long, curly moustache, would step forward and go into his 'spiel' about the wonderful picture being shown inside—'for the fir-r-r-st t-i-m-e in this countre-ee'—and for only five cents!

"Once inside the store," continued Rotker, "the audience was shown a picture on a screen about the size of a tablecloth. The movies were silly, to say the least, but they were a novelty and attracted paying patrons. The longest pictures in those days were 800 feet and took about 3 to 4 minutes to run off. It was a steady grind getting the patrons to come in and then clearing the store for the next batch of customers.

"At that time I worked from 10 o'clock in the morning to 12 midnight, with no time off for lunch. I had to grind the machine with one arm while trying to eat my lunch with the other—all for the munificent sum of $12 per week."

• Joe Tritsch, member of Los Angeles Local 150 and very well known in projection circles on the West Coast, has been appointed sales engineer for Hal I. Huff Company, manufacturer of the Huff Hydro Carbon Coolers. Tritsch will be in charge of the company's expanded national sales force.

25 Years Ago — January, 1929

• Electrical Research Products, Inc., Radio Corporation of America, and other sound-installing companies agreed to a new road scale of $125 per week for sound supervisors and inspectors. This two-year agreement became effective January 1, 1929 . . . IA men replaced non-union projectionists in the showing of commercial or non-theatrical film produced by the Fox-Case Co. These films were generally shown in hotels or salesrooms . . . Projectionist Locals were notified by the IA General Office to make certain that all sound installations in their respective jurisdictions were supervised by a member of the Alliance under road contract. "Under no circumstance," read the notice, "should the so-called 'engineers', employed by the installing company, be permitted to train motion picture projectionists in the operation of such 'talking picture' device. This work properly comes under the jurisdiction of our International Alliance and none but members of the Alliance are to serve as supervisors or instructors." . . . Clyde Weston, secretary of the Ninth District, was appointed International representative . . . E. A. (Ed) Harrell, secretary of Local 226, Waco, Texas, was elected to the office of assistant reading clerk of the House of Representatives of the State of Texas . . . Locals were warned to be on the lookout for Joe Metz, who fraudulently claimed membership in Local 293, New Orleans; John Downs, who falsely represented himself to be a member of Baltimore Local 181; and for a party by the name of Lance traveling through Nebraska and falsely claiming membership in Local 185, Spokane, Wash.

After the Technological Furore--What?

A fine projection craftsman with a flair for lucid expression offers a few very well chosen words on the passing scene of motion picture exhibition.

By CHAUNCEY GREENE, IA Local 219, Minneapolis

YOUR "Monthly Chat" in the December last issue is one of the best of the many excellent ones IP has turned out. It is regrettable that the person quoted therein preferred to remain anonymous: his was a keenly incisive insight, and he summed it all up beautifully in so few words—"the showing of wares which even then, had we known it, were feasting upon their own vitals."

Comfortably lolling, fat, dumb and happy, within the originally large margin, the exhibitor has either ignored or sneered at technology for 40 years. His sneering ignorance has now caught up with him—but good! He is now right up against it, and it is going to cost him bushels of brains, millions of dollars and years of time to get himself out of it. There is some reason to doubt if he has enough of any of the aforementioned commodities to get himself out of the crisis into which he has "doped" himself.

Staff Teamwork a "Must"

We ourselves are not wholly blameless. The modern projection processes require a projection staff as completely correlated and rigidly drilled as a Navy gun-crew, a championship tennis team, or a pair of canoeists running "white water."

Actually, for optimum results the house manager has to be a member of this team. He has to contribute his share of the teamwork. He must realize that he cannot ring the house phone at any time and expect an immediate answer. He must not expect major revisions of film assembly on short notice or assign extra-curricular tasks "just to give 'em something to do." He must allow ample time for routine service, inspection, maintenance and repair.

Above all, he must realize that once he has a projection team honed to a fine edge, if he relaxes for his own expediency the all-important criterion of "the show comes first" it will naturally follow that the team will be tempted to relax it for urgently pressing personal matters on a "sauce for the goose—sauce for the gander" basis. Once this happens, the integration of the team is destroyed.

Superlative Results Obtainable

It is interesting—and a bit amusing—to compare the operational routine of the average "movie theatre" with that of Cinerama. The comparison is about like that of some rusty old tramp freighter in Panamanian registry with that aboard the Missouri, the Midway, or (God rest her soul) the Saratoga.

Incidentally, the Minneapolis Cinerama crew has hung up a record for sustained perfection unparalleled and unapproached in the entire Cinerama organization. They are now in their 37th week without one fluff—quite an achievement for so complex a presentation process.

Sure, technology will be a vital concern of the exhibitor—until, like the introductory period of sound reproduction, we put it upon an even keel. Then the wheel will turn again, and whether it again be war or peace will depend in large measure upon the degree of mutual respect exhibited on both sides.

Film Producer Praises VistaVision; Hits Hollywood Handling of 3-D

A YEAR-END discussion with a prominent New York producer of documentary and sales films for industry resulted in some interesting insights into recent technical developments in the motion picture business, and also brought forth violent condemnation of the way at least one of the so-called new processes was handled.

Asked what he thought to be the most valuable and permanent technical development of the year, he answered, "VistaVision. When the added cost of photographing a picture in the large-frame method is compared with the total cost of production, it is found to be very small indeed," he said. "In addition, there is the pleasant prospect that a VistaVision picture can be shown in any theatre on any 35-mm projector without any changes."

VistaVision's "Important Benefits"

Despite its simplicity, the VistaVision process provides important benefits, this producer stated. "The idea certainly isn't new, because producers of industrial films have long used the method of shooting with a 35-mm camera and reducing the print to 16-mm size in printing. Wherever a negative is much larger than the eventual print, a big improvement results, compared with a print made from a negative of the same size.

"The finer-grain print emulsion is able to retain most of the detail of the larger negative despite the reduction in size. Hollywood shouldn't have waited till the grainy images on the big, wide screens forced them to put this idea to work. It would have been a good idea at any time."

The quick-money coterie who ruined 3-D were the target of the producer's condemnation. He felt strongly on this point because he produced a documentary 3-D short for a Mid-West manufacturer of which he was very proud.

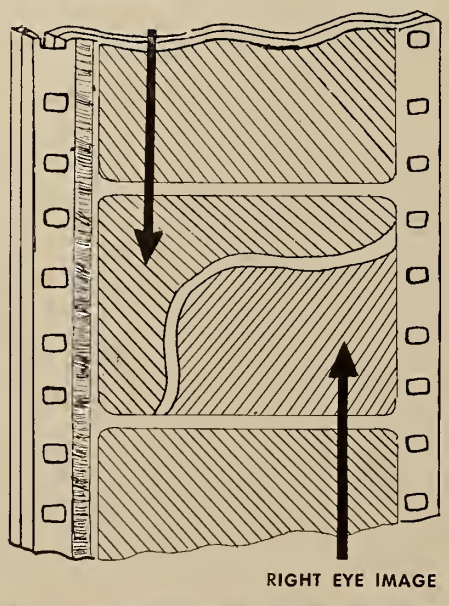
"3-D is certainly not worthwhile for every industrial film", he said, "any more than it is of value in every type of theatrical film. But it could have been of great value in the theatre with the right picture and right audience. Instead, it was overworked and forced on exhibitors and projectionists who hadn't had time to learn to handle 3-D problems. Even worse, the sloppy stereoscopic photography in most 3-D films made them eyesores to begin with.

Sensible 3-D Exploitation

"I had an idea about the proper method of presenting 3-D to the public. The methods used in presentation during the 3-D craze injured it to the point where the phrase '3-D' on the marquee started people running in the other direction instead of attracting them. I suggested a method of presentation that would have been based on a few quality showings instead of many bad ones.

"At the time that full-length 3-D films were first suggested as a means of ending public apathy toward movies, I advocated that 3-D be tried out in a limited number of theatres where equipment would be adequate and in perfect adjustment, and where higher admission prices could be charged to compensate for the extra cost involved.

"If a few good pictures were available, I believe that 3-D could have turned in an earnings record comparable to Cinerama, provided the problem were approached in the manner I suggested. Other theatres could have played the same picture flat with one print at standard prices. In this way, 3-D could have been built up as a long-range asset to the motion picture theatre.



Above is a simplified drawing illustrating the principle of the experimental Vectagraph matian picture system. It would require only one projectar because the twa images af the stereo-pair are placed an the same film-frame — ane in the front and ane an the back af the film.

Is Revival Possible?

"3-D seems dead right now; but I believe it has a chance to become important again if public resistance created by slipshod productions can be overcome. The chance may come if the current effort by Technicolor and Polaroid to perfect the Vectograph system succeeds. Vectograph is a system that, roughly explained, puts both stereo images one on top of the other on the same film frame. Projection is through one projector. The film image itself is polarized so no porthole filters or beam splitters are required, and much of the light ordinarily lost in 3-D projection is saved. The only drawback is that the audience must wear polarizing spectacles.

"The failure of 3-D projection to catch on cannot be blamed on anyone in the exhibition field—certainly not the projectionist. The two-projector system could not work well without the finest equipment and intensive training for all technical personnel concerned, starting with the cameramen.

"All theatres were not in a position to show 3-D. It's a pity that those theatres for which equipment was obtained, and where projectionists had an opportunity to learn 3-D technique, cannot now occasionally show good 3-D pictures. It might be possible to revive interest that way."

Loew's of Canada Dividend

Marcus Loew's Theatres, Ltd., of Canada, has declared a regular quarterly dividend of $1 per share, plus an extra dividend of the same amount on its common stock. Net profit per share over the year is reported at $12.08 compared with $12.56 the previous year.

Perspecta Sound Overseas

About 1,500 exhibitors throughout the world have installed Perspecta stereophonic sound systems, according to Arthur M. Loew, president of Loew's International, who recently returned from a five-week tour of Europe. About 4,000 additional orders have been placed, he said.

1A ELECTIONS

LOCAL 106, MARION, IND.

Milton Huffaker, *pres.;* Harrison Rainey, *vice-pres.;* Glenn Weaver, *fin.-sec.,* and *bus. rep.;* Arlington Hankins, *cor.-sec.;* Gene *Miller, sgt.-at-arms.*

LOCAL 150, LOS ANGELES, CALIF

Wallace G. Crowley, *pres.;* J. H. "Red" McDonald, *vice-pres.;* Charles A. Vencill, *sec.-treas.;* Clyde W. Shuey, *bus. rep.;* Clinton C. Bolinger, Virgil Crowell, John Sickinger, *exam. board;* Charles Bramel, Tom Ginthner, Ralph MacDonald, *trustees;* Albert R. Adams, Harold Angel, H. Clay Blanchett, Clem Marchand, George O'Brien, *exec. board.*

LOCAL 181, BALTIMORE, MD.

Louis P. Sieber, *pres.;* Charles J. Grauling, *1st vice-pres.:* Charles I. Dotson, *2nd vice-pres.;* Wm. C. MacKinzie, *3rd vice-pres.;* Calvert Silverblatt, *rec.-sec.;* Thomas P. Finn, Sr., *fin.-sec.;* Maurice Rushworth, *bus. rep.;* Ralph W. Rushworth (chairman), J. Harry Gentile, Sr., Thomas W. Dolan, *trustees;* Charles Gerber, Thurman L. Durst, *wage scale comm.;* Elmer Kastner, *sgt.-at-arms;* L. P. Sieber, Samuel Isaacson, and T. P. Finn, Sr., *del. Baltimore Federation of Labor.*

LOCAL 257, OTTAWA, ONT., CANADA

J. McGuire, *pres.;* J. Macauley, *vice-pres.;* W. Murray Hall, *sec-treas.;* W. H. Hartnett, *bus. rep.;* E. Field, W. H. Maxwell, D. M. Ritchie, *trustees;* S. Ventura, *sgt.-at-arms.*

LOCAL 253, ROCHESTER, N. Y.

Louis Levin, *pres.;* Joseph Pandina, *vice-pres.;* Lester D. Barager, *sec.;* Leon E. Burton, *treas.;* Fred E. Boekhout, *bus. rep.;* Louis B. Goler, *trustee;* Fred Hart, Frank Placerean, Charles Tibbetts, L. B. Goler, *exec. board;* John Copple, *sgt.-at-arms;* Charles Mason, Jr., C. Tibbetts, F. Hart, *trustees, retirement fund;* Joseph Vecchio, Sr., and Fred J. Closser, *del. Central Trades.*

LOCAL 303, HAMILTON, ONT., CANADA

H. H. Thornberry, *pres.;* S. James, *vice-pres.;* J. P. Owens, *treas.;* Hugh W. Usher, *bus. rep.;* J. A. Loughlin, H. J. Sedgwick, H. Konkle, *exec. board.*

LOCAL 343, OMAHA, NEBR.

Ora Farmsworth, *pres.;* V. Beck, *1st vice-pres.;* C. Jones, *2nd vice-pres.;* Ross Hatton, *treas.;* Clyde Cooley, *sec.;* J. I. Kelly, *fin.-sec.;* H. Jackson, *bus. rep.;* R. L. McIntyre, Clyde Blubaugh, Art Krake, *trustees;* Al Frazier, *sgt.-at-arms.*

Reduced Prices for Oldsters

The manager of the University Theatre, Cambridge, Mass., has arranged with local civic groups to admit "senior citizens" (those over 65) at a 25-cent reduction in price. In order to be eligible the oldsters must obtain identity cards from the civic groups.

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More Electronic Marvels on the March

A general idea of what we may expect in the way of practical new developments in the electronics and atomic energy field during the next decade was given by David Sarnoff, board chairman of RCA, in a recent speech in St. Louis. Describing the work of the RCA experimental laboratories in Princeton, N. J., he stated:

"The climactic chapter in the story begins as recently as 1951. On the occasion of my 45th anniversary in radio, I suggested to our research men that they invent three presents by the time my 50th anniversary arrives.

"I asked them, first, for a magnetic tape recorder for Tv programs; second, for an electronic air-conditioner; and third, for a true amplifier of light. And, amazingly, there is reason to believe that I shall receive all three of these presents within the time specified.

Magnetic Recording Progress

"The magnetic Tv tape recorder has already been produced and it functions in color as well as in black-and-white. It records and reproduces sight as readily as magnetic tape does for sound. Its implications for the future are many. To cite just one example, the Tv camera can be used to make telemovies at home. You can make a tape recording of Willie eating his porridge, and in color, just as heretofore you could record his first prattlings—and you can project it on your own Tv set.

"As for the electronic air conditioner, encouraging progess is being made and a laboratory model is now under way.

"But what interests us most directly is the evidence that the light amplifier is not too far out of reach. I am speaking of light which is produced directly within a thin layer of electronically active material. Already, I have seen this light amplification experimentally, in ratios of more than 20; and further progress is certain to be made.

"A first benefit from this research will be bigger and brighter Tv pictures in the home. I belive that the Tv tube of today will evcntually be eliminated. It will be displaced by a thin, flat screen like a picture on the wall. Or, it may be in an easel-like frame that will sit on your living room table and, being portable, can be moved to any other part of the room or house. If desired, the same program could be received on a number of screens in different rooms of the house.

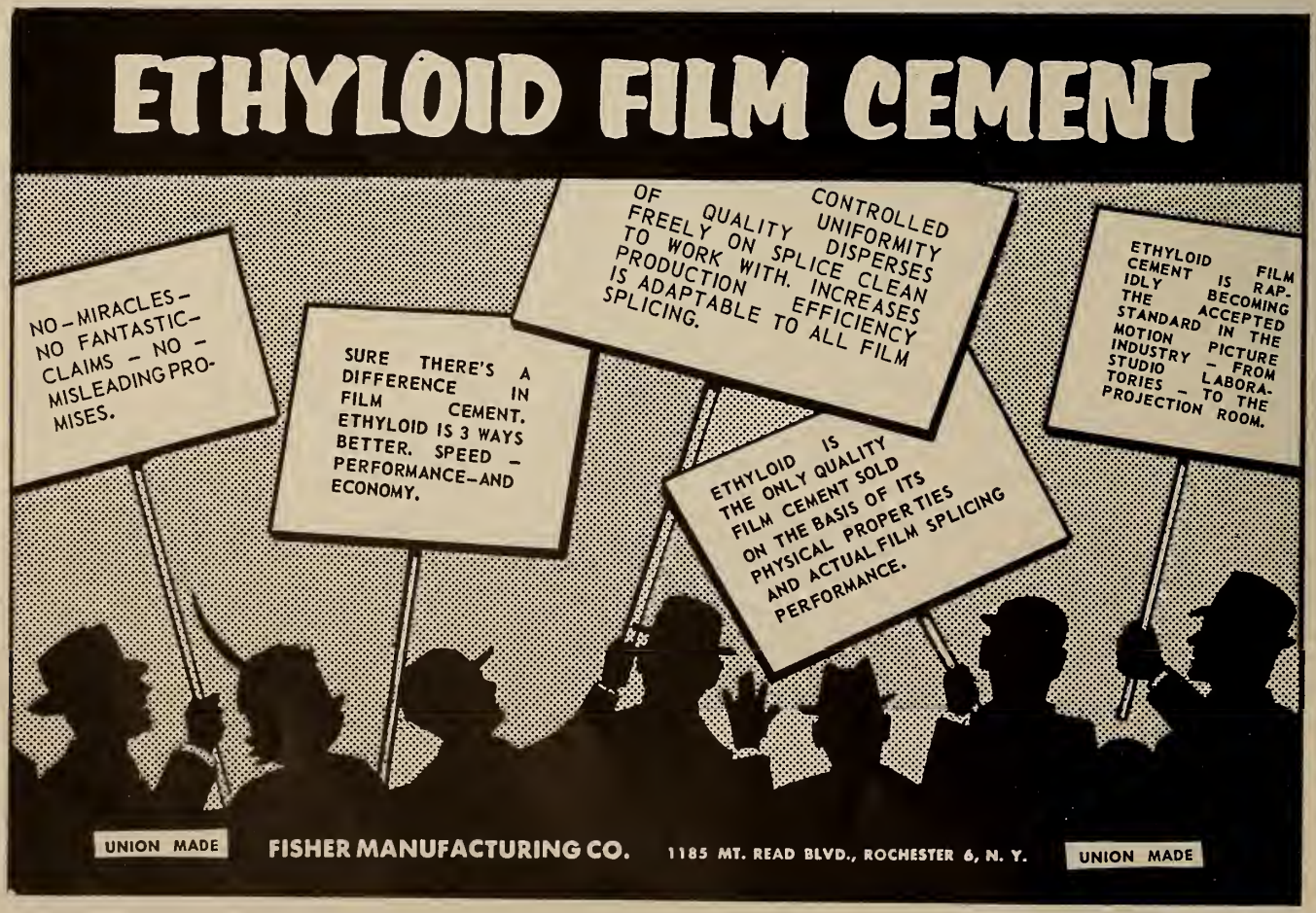
"The picture could be controlled from a little Tv box no bigger than a jewel case or cigar box. No cabinet will be required. The box will contain all the controls—tuning, volume, light, station selector—and a knob will enable you to make the image larger or smaller, and in black-and-white or in color, to suit your eye and your mood.

"Television, however, is only one of the avenues through which electronic light will flow into daily life. Right down the line it will provide substitutes for present types of light used for illumination.

Cigar-Box Tv Set

"In other areas, the electronic light amplifier may be expected to lead to devices which will make vision possible in darkness. These will add greatly to the safety of our transportation on land, at sea and in the air. The perils of night driving, too, are likely to be reduced and perhaps abolished by such electronic devices providing far-reaching light without glare.

"So much for Light, the first of the three topics in my assignment for this address. The second is Power. We require no crystal ball to foresee that in the near future power will mean nuclcar energy. That ships, locomotives, aircraft and even automobiles will in due



time be propelled by atomic fuels can be taken for granted.

"Recently, as we saw on Tv and heard on radio, President Eisenhower waved a neutronic wand over an electronic device in Denver, Colorado that set into motion a power shovel at Shippingport, Pennsylvania. The shovel in turn broke ground for the first commercial plant to be powered by atomic energy. The era of nuclear power for civilian use was touched off at that moment.

Atomic Power Plants

"Today, 73% of electric power in the U. S. is derived from steam power plants fired by coal, oil or gas, and nearly all the rest from water power. In the years ahead, electricity will be increasingly derived from atomic energy. How much of it and how soon, no one can as yet estimate with certainty.

"Last January, RCA staged a public demonstration of an electric battery powered by atomic energy. The amount of current produced was minute: barely enough to send a telegraphic message. But the implications of that moment were far-reaching. This was no longer a matter of using nuclear energy as a fuel to produce steam to generate electric current. It was the direct conversion of atomic energy into electric power. The principle has been successfully established—and that is always the break-through point in the emergence of new forces.

"When atomic batteries become available they will bring into the realm of practicality a long array of miniature devices, such as wrist-watch radios, or vest-pocket radio telephones, or electric shavers no bigger than a penknife.

The Revolutionary Transistor

"Today, the transistor is a marvelous midget already in practical use. It was born of the exploration of the electronic properties of solids. No larger than a kernal of corn, the transistor can detect, amplify and oscillate, which is to say that it can perform the fundamental functions of the familiar electron tube.

"We at RCA have built a Tv set equipped with transistors. It uses no tubes except the picture tube. We can now look ahead confidently to the day when Tv receivers will use transistors and the picture tube will make way for the new picture screen already described.

"The fact that electronics and atomics are unfolding simultaneously is a portent of incalculable changes ahead. Never before have two such mighty forces been unleashed at the same time. Together, electronics and atomics are fated to dwarf even the industrial revolutions brought by steam and electricity."

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LETTERS TO EDITOR

(Continued from page 17)

quality obtained with a sub-third harmonic, as in certain organ registrations. (The *vox humana* stops on a pipe organ has this strange tone.)

Print Condition Vital

Now, magnetic-track reproduction of the CinemaScope variety approaches the wide-frequency range of standard optical sound *only* when the print is fresh and the pickup heads are in brand-new condition. Self-demagnetization of magnetic recordings *of this type* result in a very rapid roll-off of frequencies above 4000 cycles. Only with great difficulty is 9000 cycles obtained without serious attenuation in the reproduction of CinemaScope magnetic tracks, and a value between 7- and 8000 cycles represents the practical limit with *used* prints under *average* theatre conditions.

Special types of magnetic recording easily go up into the supersonic range; but the currently prevalent "yakkety-yak" about the "high-frequency response of magnetic tracks" is the bunk, pure and simple. Optical sound did better in 1929, so far as high-frequency soundhead output is concerned, than CinemaScope magnetic sound can do in 1955. But, as we said, truly-natural, high-fidelity sound involves factors of much greater importance than raising the top-cut a note or two on the musical scale.

"Harmonic Content" Controls

The highest frequency of the audio signal that comes out of the soundhead (optical or magnetic) and the highest frequency that emerges from the system speakers are two different things. Loudspeakers are mechanical devices; and they have been an obstacle to hi-fi reproduction in three ways:

(1) They reproduce certain frequencies louder than certain other frequencies.

(2) Their range of response is limited; and

(3) They add to the sound false harmonics not present in the signal.

Verily, the *very latest* speaker assemblies capable of giving a reasonably even response from 40 to 12,000 cycles represent a significant advance in sound engineering. The average modern speaker assembly of good manufacture does well indeed to give a smooth response up to 8000 cycles. But this is a sufficiently wide range of frequencies for satisfactory sound reproduction.

We have no quarrel with the quality of CinemaScope magnetic sound reproduction when film and equipment are in good condition: the sound is "pure" and reasonably high-fidelity despite its limited frequency range and attenuation of the higher audible frequencies. But this type of magnetic sound can also be very bad, and it seldom reaches the degree of perfection attainable by the *best* optical sound. For re-recording purposes wide-track magnetic sound is probably superior even to the finest disc recording; but for general use in the theatres the CinemaScope type of magnetic sound is expensive and generally troublesome.

Optical System Line-Up

There is also no need to quibble over the difference between 9000 and 10,000 cycles as the top frequency of a sound system. By listening to a

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- The 55 foot Williams All-Purpose Silver Screen (left) installed in the Palace Theater, Akron over a year ago, still supplies sharp definition in every projection method.
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Akron, Ohio

single tone of either of these two frequencies, neither Mr. Ziller nor myself could tell which frequency it was; but if Mr. Ziller insists upon 10,000 cycles of optical sound for his hi-fi speakers, all he has to do is put his optical tubes in focus. A 10,000-cycle test film and an output meter will remove his doubts.

Let's keep in mind the fact that the highest frequency response of the best commercial hi-fi speaker units (*circa* 12,000 cycles) is not even one octave above the highest response of the older single-horn units (*ca.* 8000 cycles). The difference between these two high frequencies actually amounts to the pitch-difference represented by two keys on a paino keyboard five white keys apart.

And let's be on our guard against being duped by the popular fetish of extremely high audio frequencies. Mr. Ziller's speakers are hi-fi, not because they respond to 10,000 or 12,000 cycles instead of 8000 cycles as the top frequency, but because their response over their *entire* frequency range is smooth and clean and free from the generation of spurious harmonics.

IA OBITUARIES

WALTER BEMIS, 76, member of Local 384, Hudson County, N. J., died December 20. Born in Jamaica, Vermont, in 1878, Bemis, at the tender age of 14, wound up in New York City where he got a job as assistant property boy with Huber's Museum and Theatre, located on 14th Street. Part of his duties consisted of running slides and when the Museum got its first movie projector, a Jenkins, Bemis projected such early pictures as *The Great Train Robbery, Black Diamond Express, The Life of a Fireman,* and other movies of that vintage.

Walter Bemis joined Auxiliary Local 35 back in 1909 which was later absorbed into New York Local 306, transferring to Local 384 in 1915, where he held membership until his death. He also was a member of the 25-30 Club of New York.

An ardent unionist and expert craftsman, Bemis prided himself on his sense of fair play, and he truly lived up to the old adage "an honest day's work for a fair day's pay."

Survivors are his wife and a daughter.

NORMAN JOSEPH LARSEN, 63, member of Local 91, Boise, Idaho, died December 31st at the Veterans Hospital from a heart attack. Born in Bellevue, Idaho on October 21, 1891, Norman Larsen moved to Boise in 1903 and in 1916 he joined Local 91, of which he was a member in continuous good standing during his lifetime. He was a veteran of World War I, and a member of the American Legion.



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TOY TO GREAT INDUSTRY

(Continued from page 16)

advocated by CBS: a tri-color disc was rotated in front of the camera so that successive frames were exposed through red, yellow and blue filters. The projector shutter carried an identical set of color panels and these reconstituted the colors on the screen. The process used a film speed of 48 frames per second to achieve a complete color cycle each second. Even so, a rapidly moving object sometimes disintegrated into a path of multiple red, yellow and blue objects.

By the time World War I broke out, the motion picture industry had become firmly established. Movies had transcended the stage of being a mere mechanical curiosity and were becoming accepted as a new art form.

A young pioneer, D. W. Griffith, devised the star system, filmed spectacles and produced the first epic dramas, *Birth of a Nation* and *Intolerance*. An adventurer, Robert Flaherty, made the first documentary movie, *Nanook of the North*, still acclaimed as one of the finest films ever produced.

On the horizon were electronic sound, Technicolor, 3-D, Cinerama, CinemaScope and television — doubtless the "livingest" picture of them all. And there is no reason to believe that we have seen the end of the line, so long as men with imagination continue to play with this toy.

FILM DAMAGE INCREASE

(Continued from page 14)

Super Simplex or E-7 mechanism. The optical-sound film will rub against the hole in the top of the soundhead unless an extra guide roller is installed. The part number of this guide roller is G-2389. An alternative is to employ the special Simplex fire valve unit which is so constructed that it extends *into* the Simplex X-L magnetic soundhead.

This trouble happens to be quite common, the installation engineers failing to supply the extra guide rollers needed or reconverting the magazine fire valve assemblies. Only the base side of optical-track prints gets scratched, it is true; but even these scratches quickly fill up with oily dirt and show up as "rain" on the screen. Projectionists who have endured this bad condition for a period of months inform us that the supply company which installed the CinemaScope gear turns a deaf ear to all requests for a correction of the film path. In one theatre, it pains us to say, the chief projectionist apparently doesn't give a damn whether the film gets scratched or not; but this astonishing nonchalance is the exception rather than the rule.

Narrow-Teeth Sprockets

The narrow sprocket teeth used in projectors and soundheads fitted for magnetic stereophonic CinemaScope wear out *all* prints faster than ever before. It has been stated that the lower rate of shrinkage of modern safety film permits narrow-toothed sprockets to be used without decreasing the life of the prints. This idea is absurd: film shrinkage does not enter into the picture at all.

All modern sprockets are slightly larger than old-time sprockets, and hence fit the perforations of the film more exactly. Sprocket diameter being the same, film has a much longer life when transported by the regular wide sprocket teeth, all laboratory tests notwithstanding.

When sanity finally pervades the technological arena, the quality and condition of release prints will undoubtedly improve. Rain will then come from the clouds instead of from projection rooms.

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1954: DECISIVE YEAR

(Continued from page 12)

possible volume of light to wide screens. Perhaps the most notable development in this regard was the Kollmorgen *f*/1.7 lens described in the October issue of IP. Other manufacturers, such as Bausch & Lomb, Projection Optics, Wollensak and Vidoscope, also announced faster lenses.

Also made available by a number of manufacturers during 1954 were prismatic variable anamorphic lens units capable of "unsqueezing" not only the CinemaScope prints but the 2-to-1 ratio anamorphic prints announced by Paramount. In addition, Bausch & Lomb, the largest manufacturer of fixed cylindrical anamorphic lenses for CinemaScope, announced early in the year that it was producing a complete new line of anamorphic camera lenses that greatly improved the sharpness of CinemaScope prints.

After being obscured for some time in the shadow of the big screen, theatre Tv experienced a revival of interest in 1954. Not only sporting events, but also other entertainment such as the opening-night program at the New York Metropolitan Opera House, reached audiences in theatres throughout the country.

Theatre Tv Revives

Theatre Network Television, a firm producing Theatre Tv shows, had considerable success with closed-circuit Tv hookups to both hotel ballrooms and theatres for linking conventions and sales meetings held simultaneously in different areas. Portable Theatre Tv projection equipment was used in the ballrooms. Nathan Halpern, president of TNT, described his company's work in Part 2 of the July issue of IP.

Although no demonstrations oc-

(Continued on next page)

Stereosound Problems Solved

Use of stereophonic sound has resulted in a number of problems for recording technicians at motion picture studios, but most have been overcome, says Leon Birnbaum, music editor of 20th Century-Fox. Formerly, only a few sound tracks were employed in making a picture, but stereosound calls for as many as 20 separate tracks because all types of sound cannot be recorded simultaneously. Combining 20 tracks for the three magnetic tracks of the release print requires great skill.

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THEATRES

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curred in 1954, 20th Century-Fox engineers have been working to eliminate the last bugs in the Swiss Eidophor system of Theatre Tv, which was first described in detail in IP some years ago. This system is able to use a powerful arclamp as a light source and is therefore capable of filling a very large screen with a bright picture, a feat that is somewhat beyond the capacity of the light-gathering system in the Tv projectors now being used.

Along with projector and lens manufacturers, producers of arclamps and rectifiers were also working to better adapt their products to changes in film presentations. Obtaining a sharp, pleasing picture of large size also requires more powerful light sources. Among the companies in the forefront of these efforts were J. E. McAuley Mfg., Strong Electric, RCA, Hertner Electric, and J. E. Robin.

In addition, the National Carbon Co. is now developing carbons which will make even greater light gains possible wherever necessary in large indoor houses and drive-ins. Screen manufacturers, such as Radiant, Raytone and Bodde have been working to provide screen surfaces highly efficient in light reflectance.

Perhaps the most radical development of the year was the demonstration by RCA of an experimental method of recording not only sound but black-and-white and color motion pictures on magnetic tape. At the demonstration a color picture, originating from tape rather than film, was reproduced on a television screen. However, any application of this idea to the motion picture theatre, except possibly in connection with theatre Tv, is still far in the future.

All in all, 1954 stacks up as the year when the motion picture industry's battle to adapt itself to the age of television began to pay off. All problems, particularly those of the small exhibitor, have certainly not been solved, but the tide is turning and the future looks bright provided both the production and exhibition sections of the industry continue to fight as vigorously as they did during 1954.

LIGHT SOURCES FOR FILM PROJECTION

(Continued from page 10)

light that can be collected by the condensing lens or reflector and sent to the screen.

Much of the light production of the low-intensity arc we have been considering can be transferred from the positive crater to the arc-stream by using special cored carbons called "flame" carbons. Either the positive alone or both the negative and positive carbons of a flaming arc may have this special core which contains, in addition to powdered carbon, such flaming materials as calcium, cerium, and thorium compounds which pass into the arc-stream and luminesce there to produce a brilliant flame.

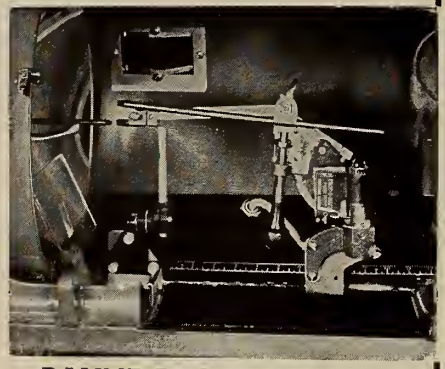
A Tremendous Advance

All of the useful light of the ordinary low-intensity arc comes from the white-hot carbon of the positive crater, so the introduction of flame carbons was admittedly a tremendous innovation in arc-light technology. The flaming arc is important to us projectionists because it led directly to a new and superior type of arc known as the "high-intensity" arc. The flaming arc is also interesting be-

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cause it can be operated on A.C. with fairly good results.

The most efficient carbon arc is the D.C. type. If an arc employing a regular D.C. trim is operated on A.C., *both* electrodes alternately become positive and negative—60 times a second if the current be 60-cycle.

A crater is formed in the end of the positive carbon in D.C. arcs because the positive gets much hotter than the negative and boils away more carbon than does the negative. Some of this vaporized carbon passes over to the tip of the negative by electrolytic action and condenses there, helping to build up the tip of the negative as a pencil-shaped cone. A good crater obviously cannot be formed in either carbon in A.C. arcs. In addition, the alternations of the current cool the arc-stream and the carbons and such an arc hums noisily and flickers.

The Beck Accomplishment

Flame carbons, by transferring light production to the otherwise only faintly luminous arc-stream, work quite well on A.C. The rare-earth atoms in the arc-stream hold the heat while the voltage drops to zero (120 times a second in the case of 60-cycle current), and the lack of good crater formation is unimportant in this type of arc. In the days of low-intensity arcs, projectionists kept a box or two of flame carbons on hand to use on A.C. in the possible event of generator or rectifier failure.

In 1913, in Germany, a scientist by the name of Beck began to experiment with flame carbons, modifying their structure and composition, and utilizing the natural magnetic field of the arc-stream to *force* the white flame to assume the form of a compact ball of gas in the crater of the positive carbon. When condensed in this manner, the radiant flame becomes even more brilliant than the white-hot carbon of the positive crater; and the arc in which this "Beck effect" is accomplished became known as the *high-intensity* carbon arc.

Larger Core Used

The core of a white-flame positive carbon is somewhat larger than the arc-stabilizing core of a regular low-intensity positive carbon. Beck made his positive core even larger and filled it with a higher percentage of rare-earth salts—compounds of cerium, lanthanum, and 13 other elements in addition to thorium, scandium, and yttrium. This change in the composition of the positive carbon necessitated a change in the volt-ampere relationship of the electric current fed to the arc.

It is well known that flaming trims worked best at their maximum current rating. Beck, or high-intensity, trims required even lower amperages, but lower voltages. Rectifiers and generators designed for low-intensity operation, therefore, usually have to be replaced when high-intensity arc-lamps are intalled. Fortunately, H. I. arcs require less ballast-drop than do L-I arcs, hence are not so wasteful of current.

[TO BE CONTINUED]

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INTERNATIONAL PROJECTIONIST

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Electronic Research Project

Electrecks, the name given to permanently polarized dielectrics, the electrical counterparts of the permament magnet —are now nothing more than laboratory curiosities without commercial utilization. Proposed research might turn up applications in electrometers, microphones, electron tubes, and electrostatic filters for removing dust. Electrets as now known can be used as the source of an electrostatic field, but not as a source of electric current.

New Kodak International Division

Eastman Kodak Co. has formed an international division to combine the former functions carried out by the company's Rochester export sales department and the European & overseas organization. The new division is located in the company's administrative headquarters at Rochester, N. Y.

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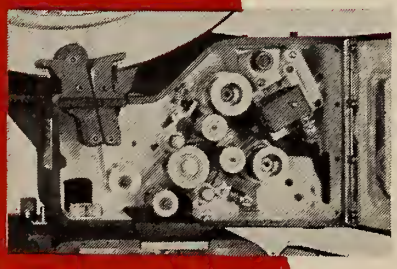


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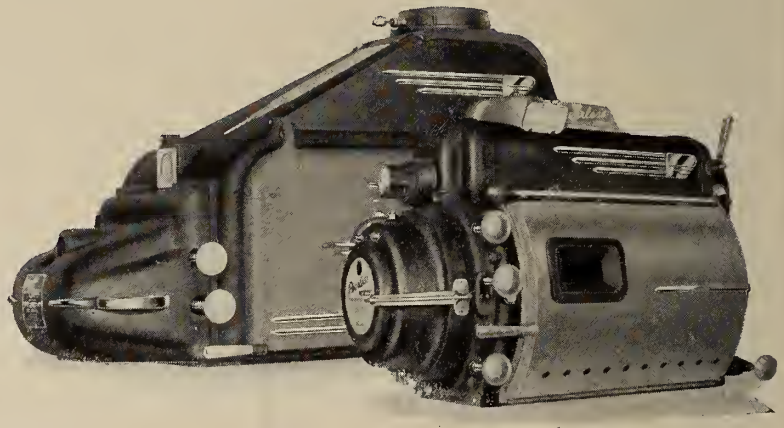
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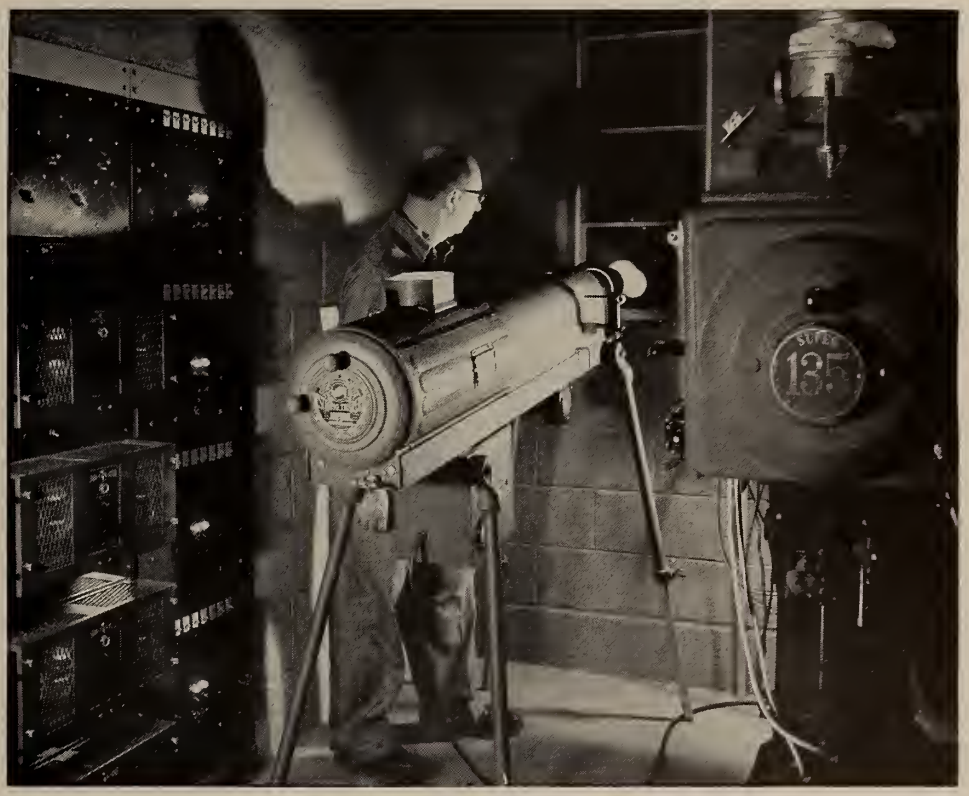
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INTERNATIONAL PROJECTIONIST

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Monthly Chat

All Industry Branches Interdependent

IP has long been the dumping-ground for complaints on the score of its "destructive" as opposed to what other segments of the industry consider a "constructive" attitude with regard to the various "new" processes in the exhibition of motion pictures. This situation is the result of an admixture of editorial independence stemming from IP's unique position of non-reliance upon producer-distributor advertising income and the financial transfusions provided IP by its unique direct-paid circulation.

That which is considered IP's "destructive" attitude boils down to its high regard for contributions of the technical personnel of this industry. Since this personnel must be paid MONEY for its effort, any champion of such a group is branded "destructive." Last month in this corner we said:

> "The critical point in the development of modern motion picture presentation was reached when the various 'new' processes engulfed the exhibition field. Technology, not subject to the whims of 'gadgets,' is gospel today."

Pretty words these; but their practical application is reflected by the expedient of *reducing* rather than *increasing* the manpower necessary for translating technological advances into economic health via paid admissions at the box-office.

Practically all the time the producers, distributors and exhibitors of motion pictures give off sounds which indicate that their labors in this never-never sphere of visual and aural fantasy are performed for the sheer fun of the doing. The result: manpower reductions in projection rooms. We could cite a few such recent examples, accomplished legislatively or by long and torturous "negotiation," but we believe that the craft is already well informed thereon.

Producers Are Still Sitting Pretty

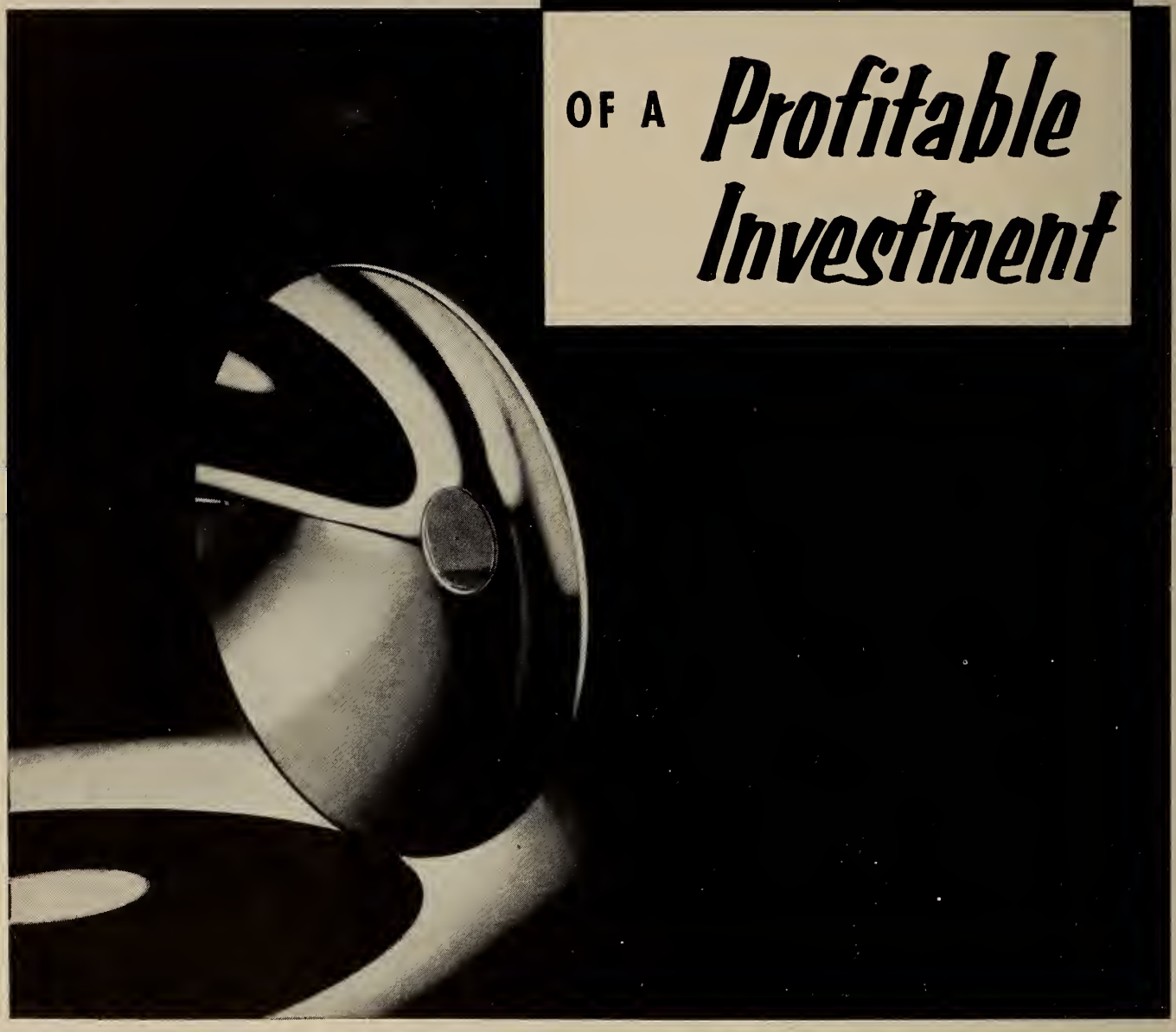
Itemized in the industry trade press within the past few days is the fact that one major producing-distributing company, Columbia Pictures Corp., announced a "record six-month *net profit after taxes and all charges* of TWO MILLION, EIGHT HUNDRED THOUSAND DOLLARS!" Other major companies are doing equally well. Columbia is not in the exhibition field, true, but its profits flow therefrom in the form of film rentals.

If the production-distribution branch of this industry continues to suck the economic lifeblood of this industry, then it will be only retributive justice that the exhibition end of this business die *via* the slow-strangulation route.

IP has long emphasized the economic fallacy of watering the leaves and neglecting the roots of the industry structure —and as of today the ROOTS of the industry are embedded in the solid foundation of technology. If proper recognition of this basic premise is not forthcoming in terms of adequate reward for those who translate this technological progress into stockholder earnings, this business as we know it today will die. Of course, the producer-distributor outfits will promptly turn to the making of films for Tv, preparations for which on a broad scale are already in the making.

IP militantly advises a militant attitude toward even a suggestion of any reduction in manpower or wages. IP's attitude is best expressed by the phrase "No tickee, no washee."

A PICTURE OF A *Profitable Investment*



■ The brilliancy of your projected pictures, regardless of the efficiency of all other equipment, is dependent directly upon the condition of your lamphouse reflector. The only light which can reach your screen must necessarily be reflected to it by this mirror.

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Vol. 30, No. 2

February 1955

Admittedly, there are few Ph.d's in projectionist ranks, but for down-to-earth knowledge and practical application of the projection process, they have no superiors. Added weight to this statement is lent by one of our boys who labored industriously and, with great care and skill, compiled the data presented in the appended article. Comment thereon is invited from craft ranks.

A 60-Degree Geneva Intermittent Movement?

By J. G. JACKSON

Member, IA Local 348, Vancouver, B. C., Canada

EXTENSIVE experiments conducted over a considerable period of time with the Geneva intermittent movement used in motion picture projectors included the building and testing of three separate models as follows:

1. A 5-to-1 ratio to obtain a screen light efficiency of 71.6%.
2. A 5-to-1 ratio with timing for television to obtain 60 exposures per second.
3. For slow-motion projection from standard 35-mm film, also timed for 60 exposures per second.

The writer believes that the results of these experiments will prove interesting not only to the projectionist craft but also to projector manufacturers.

Geneva Movement Basic Design

Figure 1 illustrates the basic design of a double-cam Geneva intermittent movement. A standard Geneva four-sided star and a four-frame film sprocket is used. The cam is double-ended with cam pins mounted on both ends at 180 degrees apart on the circumference of the cam. This double cam is mounted on a spline shaft so as to slide back and forth.

A pin in a yoke engages with a slot in the right-hand end of the cam. The yoke is pivoted at its lower end, while the upper end is coupled to an arm which is driven by a crank pin mounted on the end of a driving gear. The driving gear is coupled to the spline shaft by a mating gear with a ratio of 3 to 1.

As illustrated, the cam is at the extreme left of its travel on the spline, and the right-hand pin is engaged with the star. As the cam revolves with the spline shaft, the yoke will move it to the right on the spline, and when it has turned 1½ revolutions it will be at the extreme right of its travel so that the left-hand pin will engage the star. Then as it turns another 1½ revolutions it will again be back to the position shown.

Thus the cam revolves 540 degrees for each movement of the film sprocket, and with a 90-degree star, this gives a 5-1 ratio instead of the 3-1 in the standard movements. Thus a 60-degree intermittent.

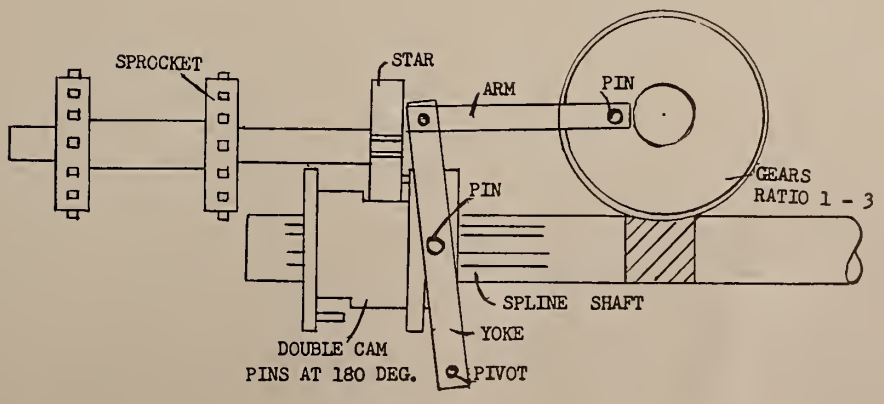
This experimental movement was used in a projector using a focal plane disc shutter revolving at only ⅜ inch from the film. Experiments were conducted with two different shutters; first, a single blade revolving at twice normal speed, or 2880 r.p.m., with a blade width of 102 degrees. This gave an efficiency rating of 71.6% with absolutely no travel-ghost.

Then the two-wing shutter was installed and revolved at standard speed of 1440 r.p.m., with blades of 54 degrees which gave an efficiency of exactly 70%.

Refer to Chart 1 to compare this with the standard projectors of less than 59% efficiency.

With this fast pull-down there is the question of film life. A life test was conducted with a loop of nitrate film, while using only a small wattage Mazda lamp for a light source to keep heat from the film. The loop ran through the projector 4,000 times,

FIGURE 1



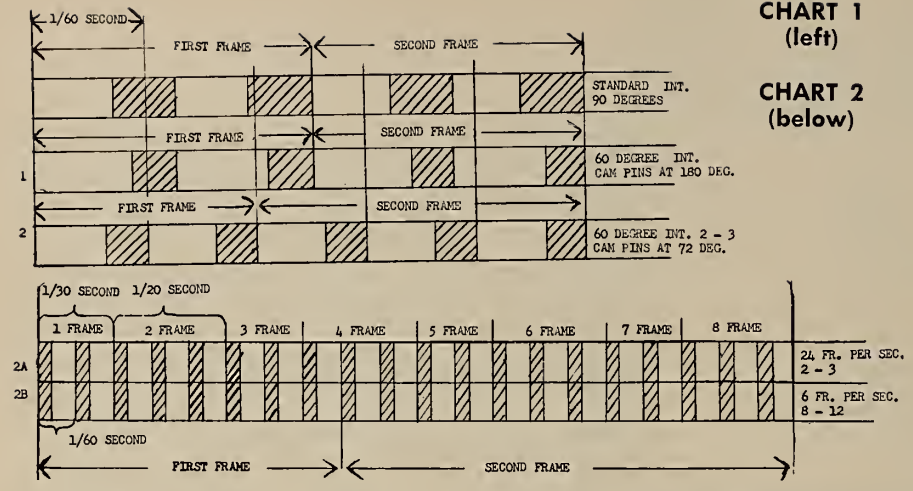


CHART 1 (left)

CHART 2 (below)

and while the sprocket holes were showing signs of deterioration they were not beyond running condition and there was no sign of unsteadiness of the picture image on the screen.

The film did break once at the splice during the test run, and again at the splice just after passing the 4,000 mark. The latter time the film caught on the sprocket and tore beyond repair, so thus ended the test. Were it not for this, it probably would have gone to more than 5,000 runs before sprocket holes failed.

Timing for Tv Presentations

After the aforementioned test the projector was dismantled and rebuilt so as to get the 2-3 timing for television:

Figure 2 shows the same double-cam principle in use, but this time the cam pins are set at only 72 degrees apart. The yoke is in one piece and is pivoted at its upper corner, and a pin in the end of the driving gear engages with a slot in the yoke. This gives an uneven movement back and forth so as to coincide with the timing of the cam pins.

Degree of Cam Engagement

As illustrated, the right-hand pin is engaged with the star, and it is assumed that the driving gear is turning to the right. When it has turned 144 degrees, the cam will be at the extreme right of its travel on the spline, and the left pin will engage the star. During this time the cam will have revolved 432 degrees. Then, while the drive gear completes its revolution by turning another 216 degrees, the cam will be to the left and will have revolved a total of 1080 degrees, or 3 complete revolutions.

With this a two-wing shutter with 66-degree blades was used and it revolved at 1800 r.p.m. While the cam turns 432 degrees one frame will be exposed twice, and while the cam turns 648 degrees the next frame will be exposed 3 times. Thus the result is a 2-3 intermittent giving 60 exposures per second from 24 film frames per second. The 66-degree shutter blades give an efficiency rating of 66.3%. Refer now to Chart 2 and compare this with Chart 1 relating to standard projection.

Again the projector was dismantled and reassembled for slow-motion projection.

Slow-Motion Frame Projection

Figure 3 shows the arrangement that gives slow-motion projection from any standard release print. Scenes photographed in slow motion appear on the screen in *ultra*-slow motion.

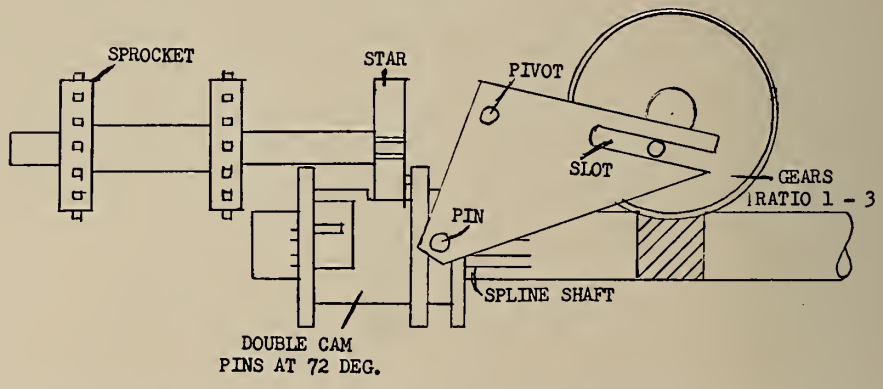
Here again the double cam is employed with the cam pins set at 72 degrees apart. The yoke is pivoted at the upper corner, and a pin which is set in the right-hand end of the yoke engages with a grooved cam which is mounted on the end of the driving gear.

The grooved cam has two extremities set at 144 degrees apart, and between these there are two neutral positions. As shown, the right pin is engaged with the star. When the driving gear turns to the right, and the star and sprocket come to rest, the pin following the grooved cam on the gear will shift the Geneva cam over to a central or neutral position where it will remain for a period of time.

While in this neutral position the Geneva cam will revolve almost 5

(Continued on page 24)

FIGURE 2



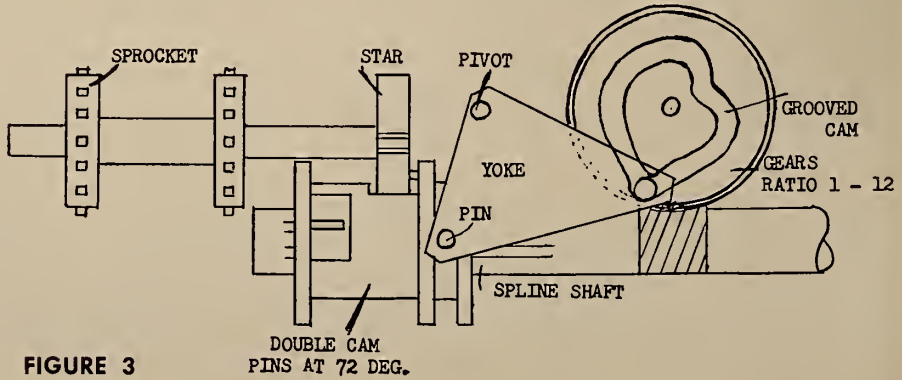
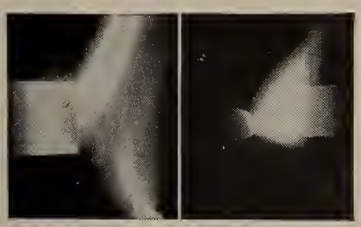


FIGURE 3

NATIONAL
TRADE-MARK
CARBONS

1000% BRIGHTER...
IMPROVING ALL THE TIME!



THE PICTURE IS LIGHT...
GIVE IT ALL YOU CAN
with "NATIONAL" CARBONS

THE NEED FOR MORE and better projection light began with the first "flicker" and grew as the industry grew. From the very beginning, "National" carbons have satisfied projectionists' demands for brighter, whiter light and slower, steadier burning.

SINCE "NICKELODEON" DAYS, the brightness of "National" projector carbons has been increased more than 1000 per cent! And, today, with giant screens becoming almost universal, arc-carbon progress continues to meet the challenge.

FOR EXAMPLE, the new "Suprex" 8mm carbon, latest in a long series of recently improved "National" carbons, provides *15% more light* and a higher color temperature than its predecessor — at *no increase in cost!* Yes, the picture *is* light... and with "National" carbons you are sure of getting it in fullest measure.

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation • 30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco
IN CANADA: Union Carbide Canada Limited, Toronto

times, or 1728 degrees. During this time the shutter will expose the film frame 8 times. When the driving gear has turned 144 degrees, the yoke will shift the cam to the right so that the left pin will engage the star and move the film to the next frame. Then the cam will shift back to neutral again and remain there for another period of time. This time the cam will revolve more than 7 times, or 2592 degrees, and the shutter will expose the film frame 12 times.

Thus the film frames are exposed alternately, one frame 8 times and the next 12 times, while the film passes through the projector at the rate of only 6 frames per second. The two-wing shutter revolves at 1800 r.p.m. giving the 60 exposures per second for television.

Chart 2A is a condensed form of chart 2 and shows 8 frames of film timed at 2-3. Chart 2-B shows that of slow-motion projection of only 2 frames which coincide exactly with that of the 8 frames above, each of which represent ⅓ second on the screen.

Speed, Flicker, Motion

With the high-speed shutter there is no flicker, and the image shift from frame to frame is very smooth on normal subject action, no jerk or jump is noticeable. If the subject action is fast, such as a car traveling broadside past the camera at high speed, then there is naturally some noticeable image shift.

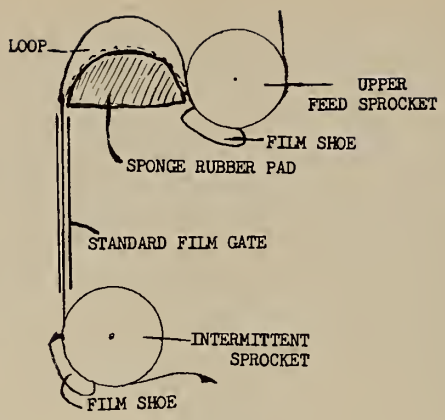


FIGURE 4

This slow-motion principle need not necessarily employ the high-speed Geneva cam but can be worked out at standard cam speed of 1440 r.p.m., which of course calls for wider shutter blades. It can also be attained with the cam pins at 180 degrees and at various cam and shutter speeds; also at any desired number of frames-per-second projection speed.

Thus the slow-motion principle is quite flexible. The use of this would apply to education or industry where it is desirable to retard normal screen action for close examination.

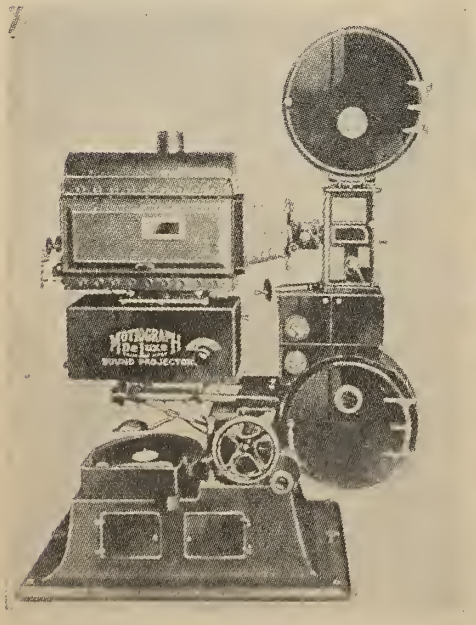
As mentioned previously, the life test on a loop of film was more than 4,000 runs. This long film life was obtained by the use of a special film-braking system which allowed the film gate tension to be reduced to a minimum, with only sufficient pressure to keep the film flat at the aperture. A sponge rubber pad is placed within the upper loop (Fig. 4).

At the beginning of pull-down the loop is full and does not touch the rubber pad. With very little tension at the gate, there is a minimum of strain on the film during the acceleration period. As the film slows down and comes near the end of pull-down, the upper loop comes in contact with the sponge rubber pad which applies the braking action to prevent the film from overshooting the aperture.

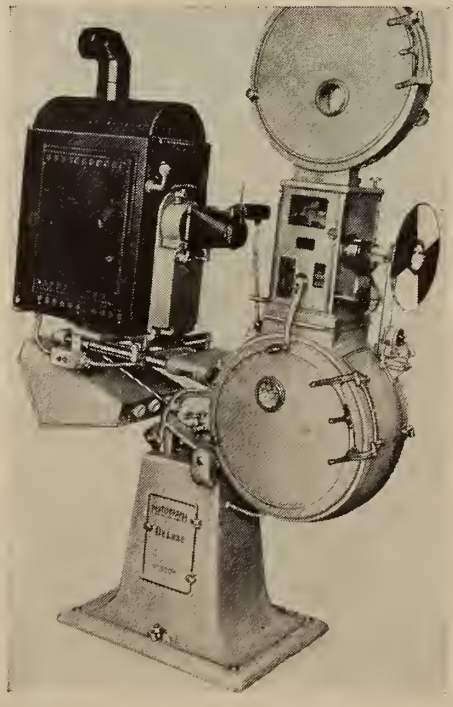
The braking action of the rubber pad acts in two ways: first, by friction on the surface of the film; and second, by pressure within the entire

(Continued on page 24)

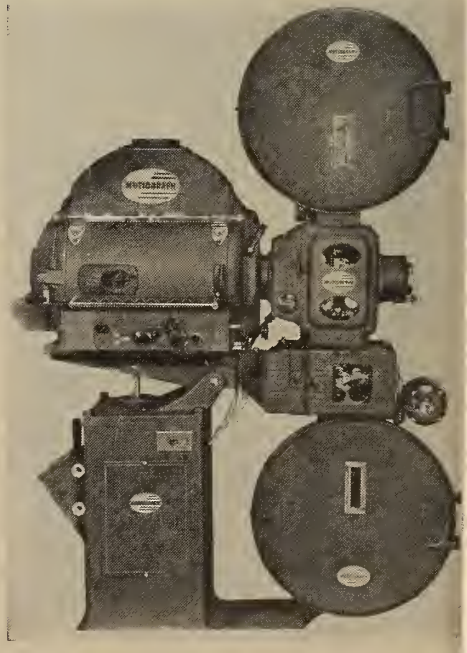
PICTORIAL REPRESENTATION OF MOTIOGRAPH PROJECTOR PROGRESS THROUGH THE YEARS



Motiograph was ready for sound with the Model "H" in 1926. This madel had the first double shutter, and introduced Motiograph's sound system which repraduced sound on film and Vitaphone records.



Model F (1921) enclosed mechanism for first time; shutter had twa blades and a timing device far increased operating efficiency.



Motiograph's postwar projector; the Model AA, latest of the line, was brought out in 1946. It embodied radical impravements in performance and operatian. It is shown here on an S base with 25-inch magazines.

The Todd-AO Projector For Both 70- and 35-mm Film

LATEST ENTRY in the wide-screen sweepstakes is the Todd-AO process details of which have until recently been shrouded in secrecy. In early February this veil of secrecy was rent and permitted the seeping through of those facets of the projection process which are appended.

The Todd-AO system is unique among the current wide screen processes in that it utilizes 70-mm film for both photography and projection. The advantages of such a film size in terms of fine grain structure and additional screen light are obvious. Another feature of the system is that the projector can utilize both 35- and 70-mm film, this being accomplished by dual sprockets and the simple insertion of a different gate for 35-mm

25 Roadshow Openings

The Todd-AO projectors were made by the well-known Philips organization in Eindhoven, Holland, the original order being for 50 which would serve for 25 roadshow openings in major cities in the U. S. A. The premiere public showing of the process will occur early in May in New York City when the Todd-AO film "Oklahoma" bows. All 70-mm films will be produced by the Todd outfit itself.

Precise technical data anent this new 70-mm projector are lacking, thus the information presented here, which emanated from the Todd people, must be considered as exploratory in nature.

Claims for Versatility

Todd-AO avers that the new projector, designated the DP70, is suitable for:

1. 70-mm film with any number of magnetic sound tracks.
2. 7-mm film with separate sound film.
3. CinemaScope film with four magnetic sound tracks.
4. CinemaScope film with optical sound track or Perspecta sound.
5. Wide-screen films of any size, provided with either magnetic or optical sound tracks.
6. Standard 35-mm film.
7. 3-D films according to the single-film system.
8. 3-D films according to the twin-film system.

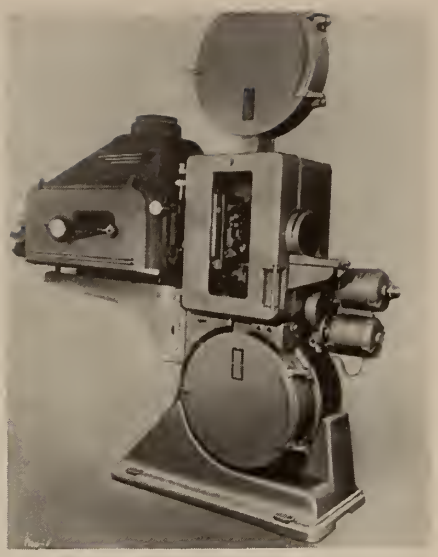
Such versatility sounds like a large order, but actually the switchover from one type of film to the other is easily accomplished by the use of the supplementary parts supplied by Todd-AO. For example, it is not necessary to change any sprockets for the changeover since all sprockets have two sets of teeth to accommodate both 35- and 70-mm film. The 35-mm sprocket teeth are slightly recessed in relation to the outer 70-mm sprockets so as not to interfere with the wider film.

Sound Reproduction Facilities

The outer flange of the intermittent sprocket has 20 teeth; the inner flange has 16 teeth. All sprockets are universal, as are the firetrap rollers, and need not be replaced when switching from 70- to 35-mm projection. Incidentally, this switchover is said to require only ten minutes, with the mask for 35-mm film being inserted in a few seconds.

Sound reproduction facilities have been mentioned previously. The Todd 70-mm film will have six sound tracks; and adaptation for other mediums of sound reproduction may be easily accomplished.

The soundhead for the scanning of magnetic sound tracks is located on



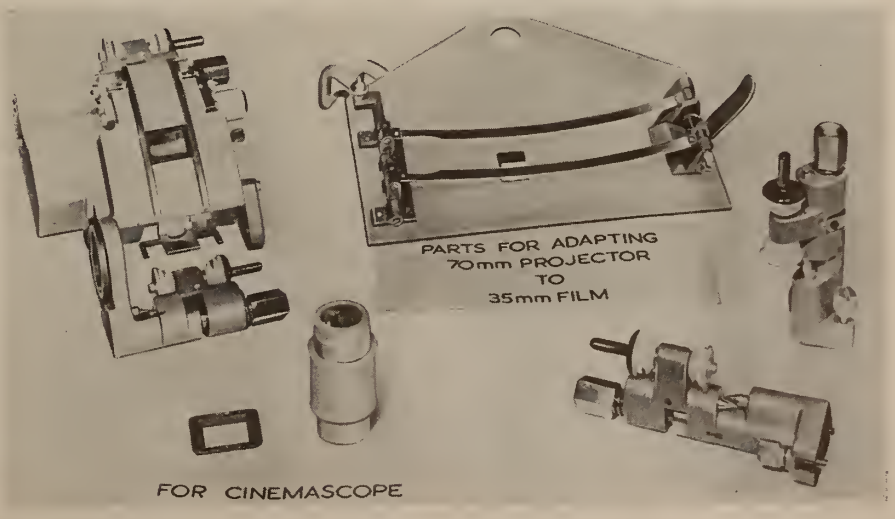
Full view of the Todd-AO oll-purpose projector which will hondle normal 35-mm film, 70-mm film, single- ond double-film 3-D systems, ond ony number of sound tracks.

the top part of the projector. Either a scanning head for 70-mm film or a scanning head for CinemaScope film can be placed on two guide pins at the top of two rotating sound drums. The guide rollers of the soundhead and all other guide and pad rollers that are in contact with the magnetic soundtrack are made of nylon. The soundhead may be removed as one unit by simply loosening four screws.

Drive, Dual Sprockets, Speed

The driving mechanism is housed in an oil-tight casing, sealed hermetically by means of a large cover to protect it against dust. The cover is fixed with five screws which may

Parts which have to be suited or added for prajectian of other than Todd-AO 70-mm film. Modificatian requires only 10 minutes. The mosk of the gote for 35-mm film projection can be replaced in a few seconds far CinemaScape ar other wide-screen rotios.



be easily removed for inspection of the mechanism.

All sprockets, the intermittent mechanism, the shutter and the take-up, are driven by a vertical main shaft. This shaft in turn is driven by a horizontal shaft, which also drives the spur-gear oil pump located at the bottom of the projector housing. All of the gear-wheel transmissions and bearings are lubricated by an oil conduit with tappings.

The projector provides for two different film speeds. The horizontal driving shaft of the projector is coupled directly to a driving motor for a speed of 30 frames per second when 70-mm film is running. This same driving shaft can be coupled by a gear-wheel transmission to another motor for the standard speed of 24 frames per second for 35-mm film. Two separate drive motors are used rather than a speed-change gear box because they permit a simpler system of construction.

Gate and Screen Curved

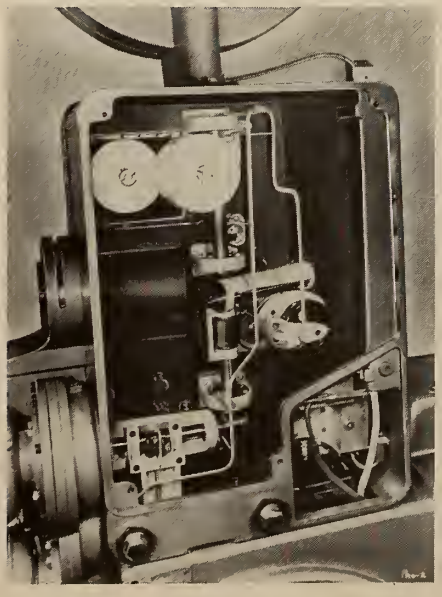
Todd-AO presentations will, of course, utilize a screen with a center depth curve of 15 feet. Overall picture size is expected to approximate 25 feet high by 51 feet wide, a 2/1 ratio.

A curved projector gate will be used in order to minimize the tendecy of the much wider 70-mm film to bend and thus get radically out of focus. Standard pressure pads have been replaced by thin strips which are attached to a hinged plate. Pressure in the gate can be adjusted by tightening or slackening these strips.

The hinged plate faces the shutter and must be pushed aside for threading the film. The problem of the positioning of the shutter just behind the gate was overcome by providing that the knob for pushing aside the plate can be operated only when the shutter is in such a position that the plate can pass freely. It is impossible to start the projector when the plate has been pushed aside.

A single-blade conical shutter of very large diameter is used. At a film speed of 30 frames per second the shutter rotates at 3600 r.p.m.; while at a speed of 24 frames per second its speed is 2800 r.p.m.

Driving mechanism of the projector, housed in oil-tight casing which is closed hermetically by means of a large cover. Cover is fixed by five screws, easily removed for inspection.



Cooling Means, Magazines

Water and air cooling of the projector gate and the film are utilized. Todd feels that water cooling is insufficient, and may even have a negative effect, because of the difference in temperature between the image area and the edges of the film frame, thus inducing buckling. The shutter is relied upon to suck in cool air and blow it upon the film.

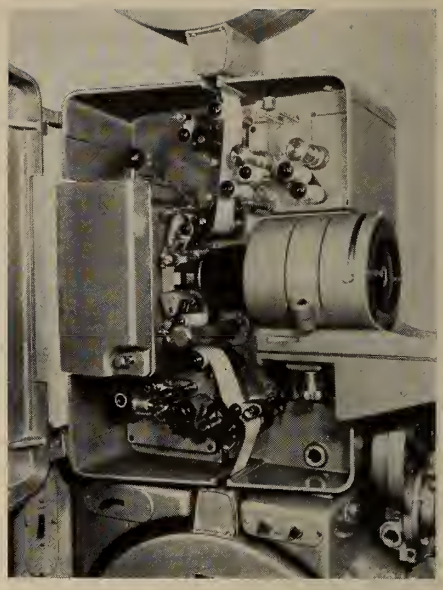
Sleeves with different inner diameters can be mounted in the lens holder to accommodate various projection lenses. For 35-mm projection the optical axis is shifted to proper position by means of a small knob in the slit of the lens holder.

The film magazines accommodate 3,100 feet of 70-mm film, thus allowing an interval of 22 minutes between changeovers. Magazine shafts are ½ inch in diameter. Both magazines have adjustable friction devices, with the upper magazine being illuminated and having running-time scales relating to both 70- and 35-mm film.

The structure of both the mechanism and the base are said to enable the use of any arclamp provided its optical characteristics are suitable for the Todd film image. It has been bruited around in the trade that at all private showings of the Todd process to date 280 amps was the current level.

One Informed Opinion

One nationally-known projection supervisor who witnessed such a showing discounted this talk and said he saw no reason why 180 amps at the most shouldn't suffice. He pointed to the double-frame showings at the Radio City Music Hall (N. Y.) as "proof of the pudding." Supplementary comment on the Todd showing by this same personage ran as follows.



For purpose of achieving perfect definition, the distance between film in the gate and projector lens does not vary. Projector is equipped with curved runner plate. The slight bend in longitudinal direction gives film greater stiffness in transverse direction.

"The quality of the picture was very good—and why shouldn't it be under such favorable conditions? The images were sharp, bright and steady. But, as with all curved screens, there inevitably was distortion of the screen image.

"The nature and extent of this distortion depends upon one's seating location. I was seated at the right. Players entering the scene from the left appeared to me to be stout; as they approached the center of the scene their figures appeared normal; as they continued toward the right side they grew thin.

"To a person seated at the left of the theatre the effect would have been just the reverse. The same fault is apparnt in any curved screen, with the degree of distortion depending upon the depth of the screen curvature. This may not be objectionable to the general public, since they don't beef about the same fault in Cinerama. Of great benefit to Todd-AO was the fact that the picture was in sharp focus over the entire screen area.

"My personal opinion is that the Todd system represents essentially just another wide-screen process and that like all other screen presentations the vital factor lies not so much in the

(Foot of Col. 1, next page)

World-Wide Concern About Technological Standards

BRITISH FILM circles are also seriously concerned about the lack of technological standards anent the screen image aspect ratio. This concern was rather forcibly expressed at a recent meeting of the British Kinematograph Society (Theatre Division) which, not surprisingly, was well attended by engineers and projectionists but fell dismally short in terms of exhibitor attendance.

Presiding over the conclave was an old and valued friend, R. E. Pulman, a practical projectionist (Circuits Management Assoc., Ltd.) who is remembered affectionately by the many friends he made upon the occasions of his several visits to the U. S. and Canada.

Through the medium of *The Ideal Kinema,* British trade journal, IP is privileged to present the following summary of the discussion.

THE FORUM was opened by Dr. Leslie Knopp, who stated that the philosophical aspects were not outside the scope of the discussion. With the 3-D picture, he continued, the idea was to bring the picture into the audience, while with wide-screen presentations it might be said that the idea was to bring the audience into the picture.

No Proper Aspect Ratio?

Dr. Knopp said that in the matter of screen shape and size, the industry was like Stephen Leacock's hero, who mounted his horse and dashed off in all directions. Some months ago he had taken steps towards a standardization of aspect ratio, but had been told by every section of the trade that standardization was premature.

However, he put forward the proposal that two ratios should be established—at 1.75 and 2.55/1, a proposal which met with general support.

G. E. Fielding, chief engineer of Associated British Cinemas, pointed out that in America a number of producers were shooting only in CinemaScope, with the idea that non-anamorphic prints might later be made. A ratio of 1.85/1 would result in cropping about 12% of the picture, and he recommended this, rather than the lower figure.

S. B. Swingler, engineering controller of Circuits Management Assoc., took the opposite view, pointing out that a majority of films were still being photographed on old-type cameras for ratios of 1.6 or 1.66/1 and neither studio nor laboratories wished to make changes at this stage until a new standard was adopted. Foreign films shot for the 1.33/1 ratio and shown with superimposed titles could not be cropped.

"Letter-Box" Screen Image

J. A. Walters objected to the "letter-box" effect of the CinemaScope picture when seen from the back seats. VistaVision was returning nearer to the old ratio. In the old days the better seats were at the rear, but now the technician was reversing the trend. The tastes of patrons, he thought, must eventually decide the question of ratio.

Walter Lassally, supporting this view, suggested that the high aspect ratio had been adopted as a result of the low overhanging balconies of many American theatres, which prevented the screen being increased in height. He urged that the BKS should recommend the retention of the old standards of 1.33/1, which had been originally determined as a compromise to suit various types of composition.

J. L. Stableford, the screen maker, disagreed with this proposal. He considered the old picture size too small. Since the limiting factor in many theatres was the height of the picture, any increase must be in width. But a too large picture suffered from grain trouble. We had had no chance of passing judgment on any ratio between those of CinemaScope and wide-screen, he said, and we must eventually decide whether we were giving the public what they wanted.

Image Ratio Change Forecast

He suggested that a time might come when wide-screen ratios would go up and CinemaScope ratios come down, so that eventually we should have the one shape of picture and variable screen masking would be a thing of the past. He thought every theatre should show a picture of 1.75/1 ratio.

R. Butler, a Gaumont projectionist, objected that recent developments were proving detrimental to the seats that were most filled at the front and sides.

Martin Beer, joint sales manager, GB-Kalee, said that he was primarily concerned with meeting the requirements of independent exhibitors. One problem was: how was picture ratio going to affect sight lines? The IES regulations fixed the maximum height of picture, and dependent upon that and on the width of the proscenium, he had to consider whether it was possible to get in a CinemaScope picture. Often movable masking was necessary—generally at both top and sides.

An exhibitor might want the 1.33/1 ratio as well as the 1.66/1 and the CinemaScope ratios. He pointed out that the variable anamorphic lens could

(Continued on page 29)

TODD-AO

(Continued from page 12)

form of presentation as in high entertainment content."

Numerous skilled technicians have had a fling at 70-mm film projection, the best remembered probably being the George Spoor 65-mm effort in the 1930's, and the Fox Film whirl with Grandeur during the same period. Whether Todd-AO has licked the problem remains to be seen; but if their pictures are to be confined to roadshow situations and no 35-mm prints released, the matter is hardly one of industry-shaking consequence.

"Tomorrow night we'll sit on the other side of the theatre and see the rest of the show."



Submitted by Norman G. Campbell
Campbelltown, N. S. W., Australia.

Light Sources For Film Projection

By ROBERT A. MITCHELL

The vital part played by magnetism in the behaviour of the high-intensity arc, and the controversy anent water-cooling carbons for greater screen brightness are covered in the second instalment of this series.

MAGNETIC effects are extremely important in H-I arcs. An electric current sets up a magnetic field around the conductor through which it travels. The carbon and arc-stream of an arc conduct electricity and they are also surrounded by magnetic fields. Beck made these fields *push* the flaming gas into the positive crater by distorting them.

It is easy to demonstrate the great sensitivity of the arc-stream to magnetism by bringing the tip of a magnetized screwdriver close to a burning arc. The magnetism of the screwdriver repels the arc-stream like a blast of air, and, if brought too close, will actually blow out the arc.

When the carbons in an arclamp are positioned horizontally, as in a low-intensity mirror lamp, the magnetic field is uniform. By positioning the negative carbon *at an angle* to the specially cored positive carbon, Beck made the magnetic field dense underneath the arc and comparatively weak above it, as shown in Fig. 2. Since the arc-stream gases have a tendency to move into the region of weaker magnetism, this clever expedient served to push the radiant gases into the crater, where they get very hot before overflowing into the arc-stream and tail-flame.

Not all of the heat comes directly from the positive crater, however. The electrons which travel across the gap from negative tip to positive crater must penetrate the gas-ball. The rare-earth atoms of the gas-ball are accordingly bombarded by a dense stream of electrons; and this continual bombardment excites the atoms into a state of super-brilliance.

H-I Arc Current Density

Because the Beck arc requires a higher current-density than the old-type carbon arcs—that is, a higher amperage for the specific diameter of positive carbon used—the Beck arc is usually called a *high-intensity* arc, and the ordinary arc a *low-intensity* arc. The term "intensity" refers to current (the "I" of electrical formulas), *not* to light—though, of course, H-I arcs are indeed brighter than L-I arcs.

It is this high current-intensity of H-I arcs which is responsible for the very deep positive crater. The crater of the L-I arc is relatively shallow—almost flat, in fact. Now, the great depth of the H-I crater is very necessary as a receptacle for the gas-ball, which would otherwise stream away in the tail-flame and be utterly lost.

Contrary to popular opinion, the flaming materials of the H-I arc are not ionized to an appreciable extent. Careful tests have discovered some ionization, but it is not important. The atoms are *excited*, which means that the planetary electrons of the rare-earth atoms shift back and forth between low-energy and high-energy orbits—but the voltage at the arc is not sufficiently high to strip the atoms of electrons.

Crater Gap-Space Important

As we know, about 90% of the total light of the L-I non-flaming arc comes from the crater of the positive carbon, and of this fully 100% is due to white-hot solid carbon. In the H-I arc, only about 65% of the total light comes from the positive carbon (5% coming from the negative tip and 30% from the arc-stream), and three-fourths of this 65% emanates from the luminescent gas ball, and about 25% from the white-hot solid carbon of the crater floor.

If the lip of the positive crater accidentally breaks off so that the gas-ball streams out, the light drops to about 25% of normal and turns yellowish. This may happen if the carbons are jammed together too hard when the arc is struck; but the carbons are so quickly consumed in H-I arcs that a new crater of proper depth is quickly formed.

Mention has been made of the light of the L-I arc as "white." The L-I arc-light is indeed whiter than the light produced by the glowing tungsten filament of an electric lamp bulb, because the temperature of the carbon crater is higher. But the H-I arc is even whiter, more closely matching the color of noonday sunlight. The flame materials added to the cores of H-I positive carbons are responsible for the perfect spectral balance of this light source. When a yellower light is desired (such as when 16-mm color films are to be projected) a slightly different core mixture may be used.

So important is a symmetrically-formed positive crater to the satisfactory performance of the H-I arc that the positive carbon is rotated by the feeding mechanism. This method renders the position of the negative carbon less critical and eliminates the need for troublesome vertical and horizontal negative adjustments. Moreover, the current is applied to the carbons close to the arc, eliminating the undesirable voltage-drop which would occur if the current were made to travel through the entire length of the carbons.

Operational Procedure Vital

Many of the problems overcome by the regular H-I arclamp reappear in the so-called "simplified" H-I arc, which is anything *but* simplified. This modified form of H-I arc does not

Aperture Plates with Retaining Springs Available in the Following Ratios From LaVezzi, Chicago

PART NO.	RATIO	SIZE	
SP-672-E	1:33:1	Standard	.600 x .825
SP-672-E-0	1:33:1	Undersize	.600 x .800
SP-672-E-1	1:66:1	Standard	.400 x .825
SP-672-E-2	1:66:1	Undersize	.490 x .800
SP-672-E-3	1:85:1	Standard	.440 x 825
SP-672-E-4	1:85:1	Undersize	.400 x .800
SP-672-E-5	1:75:1	Standard	.460 x .825
SP-672-E-6	1:75:1	Undersize	.460 x .800
SP-672-E-7	2:1	Standard	.400 x .825
SP-672-E-8	2:1	Undersize	.400 x .800
THE FOLLOWING FOR CINEMASCOPE:			
SP-672-E-10	2:55:1	Undersize	.650 x .850
SP-672-E-12	2:1	Undersize	.650 x .650
SP-672-E-14	2:33:1	Undersize	.650 x .775
*Pat. Pending			$2.90 each.

work as well and is much more difficult to operate satisfactorily, than the regular H-I arc having a rotating positive carbon and an inclined negative carbon.

In general plan, a "simplified" H-I arclamp resembles an old-style L-I reflector lamp. Both carbons are positioned horizontally, and both are grasped by the carbon jaws near their ends, the current travelling through long lengths of carbon. Two serious difficulties arise—lack of a non-uniform magnetic flux to hold a gas-ball in the positive crater, and loss of current by forcing a heavy amperage to flow through long lengths of small-diameter carbons.

Special means have been employed to solve these problems and make possible the use of cheaply-manufactured lamphouses. The advantages of the "simplified" H-I arc over the *regular* H-I arc are solely economic, and have nothing to do with projection quality.

The problem of creating a luminescent gas-ball and holding it in the crater of the positive was solved, they say, by placing a magnet in the lamphouse. This is usually positioned behind the mirror, its poles being rather low so as to push the arc gases up and back into the crater. Without this magnet, the H-I effect is lost, and the arc operates as a rather inefficient low intensity flaming arc.

The strength of the magnet is a critical factor in the operation of these lamps. The better lamps have electromagnets connected in series with the arc in order to ensure a change in magnetic flux with a change in current.

Permanent Auxiliary Magnets

Permanent auxiliary magnets are often positioned underneath the arc to help stabilize the flame, but the main electromagnet does most of the work. The strength of the electromagnet should be adjustable to enable the projectionist to establish burning conditions best suited to the trim and arc-gap he prefers.

The problem of feeding the current to the "simplified" H-I arc is solved by plating the carbons—both the cored positive and the solid negative—with copper. Copper conducts electricity very well and prevents the voltage-drop which would occur if uncoated carbons were used. A *constant* voltage-drop would not be too serious; but variations in "drop" caused by variations in the length and conductivity of the carbons would make the arc very unstable and uncertain in terms of light production.

The copper coating on the carbons should be sufficiently thick to deliver without loss the full current at which the carbon trim is rated by the manufacturer of the carbons, and it should not include any loss due to carbon voltage-drop. If the copper is thick enough, there will be no appreciable carbon drop!

Scarcity Expedients Unworkable

During World War II the scarcity of copper forced the manufacturers of carbons to apply thinner coatings to their "simplified" H-I carbons. These carbons did not burn satisfactorily at full current rating or, in fact, at any current. There is no serious shortage of copper at present.

The basic principles of the regular L-I arc, the flaming L-I arc, the regular H-I arc, and the so-called "simplified" H-I arc have now been reviewed, but much more remains to be told about these and other light sources used for the projection of motion-picture films.

If the reader will consider briefly what has been said about each type of arc, and then stop to ponder the many special features and operating peculiarities of each, he will undoubtedly think of a number of things which we have not mentioned at all. We have yet to describe the effects of changes in voltage and current, the volt-ampere characteristics required of a power source for arclamps, the effect of water-cooling the carbons, the optical problems connected with arclamp design, *etc.*

Instead of taking up these matters (important to projectionists) in systematic order, let's jump around a bit. Water-cooling the carbons of the high-intensity (H.I.) arc is certainly an interesting topic, and a very controversial one, too!

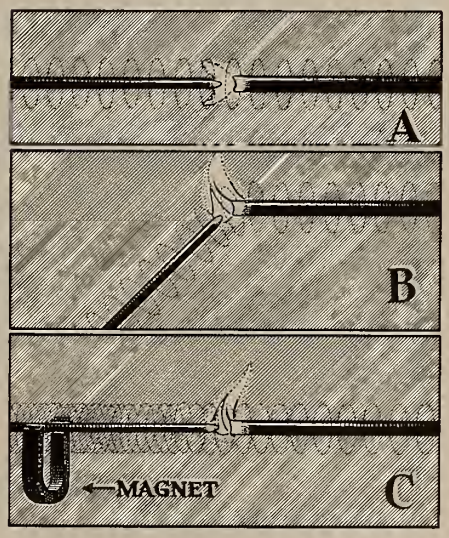


FIG. 2. The high-intensity arc requires a specially-cored positive carbon, high-current density, and a non-uniform magnetic field at the arc to hold the luminescent gases as a radiant ball inside the deep crater. This gas-ball is even brighter and whiter than the hot carbon of the crater.

***A* shows what happens when the magnetic field is uniform. The luminescent gases stream out of the crater and become too thin to glow brightly. Such an arc resembles the old-style flaming arc.**

***B* illustrates how this arc may be made into a real high-intensity arc. It is only necessary to position the negative carbon at an angle to render the natural magnetic field of the flowing current (indicated by the faint circles) dense below the arc and thin above it. The glowing gas is thus pushed into the crater and held there as a luminous ball.**

***C* shows the method employed in the "simplified" high-intensity arc. A magnet furnishes the desired magnetic field.**

Effect of Water-Cooling on Arc

In order to understand what water-cooling really does to an arc, it is absolutely necessary to have a good idea of the processes that take place inside a burning H.I. arc. These have been described previously, so we already know that the intense heat in the positive crater is due to the electrical resistance of a relatively cool layer of carbon gas (called the anode layer) which covers the crater floor.

In a word, the electrons travelling from the tip of the negative carbon to the crater of the positive carbon are slowed down by the anode layer. The "friction" (resistance) of this layer takes energy from the electrons and gives it to the crater floor where it shows up as heat—and plenty of it.

L. I. Arc Characteristics

In the low-intensity (L.I.) arc all of the usable light comes from the white-hot solid carbon of the positive crater. The carbon there is constantly boiling—or, rather, evaporating—but the moment the carbon turns to vapor it loses its brightness and goes into the arc stream and tail-flame. The carbon is thus gradually consumed.

The crater of the H.I. positive also has a floor of white-hot boiling carbon, but most of the light of the H.I.

arc comes from a super-brilliant ball of luminescent gas held inside the crater by magnetic forces. This gas, excited to great brightness by electron bombardment, comes from rare-earth salts and other "flame materials" vaporized by the heat of the crater from the core of the carbon.

Now, the presence of the luminescent gas-ball of the H.I. arc has an adverse effect upon the "anode voltage drop," or resistance of the anode layer. The rare-earth compounds are very conductive in a vaporized state, hence the resistance of the anode layer decreases. As a result, the temperature of the crater drops off, and the arc does not burn well. This is what happens when any H.I. arc is powered by a generator designed for L.I. arcs.

H. I. Arc Current Load

This problem was solved by increasing the current (amperage) and decreasing the voltage for H.I. arcs. With a heavier current the H.I. anode layer offers sufficient resistance to permit the arc to burn properly. But the heavier current does something else, too. It makes the positive crater very much deeper than the normal L.I. crater, which is almost flat.

Other problems created by the excessively high current densities at which H.I. arcs are operated involve methods of feeding the current to the arc. The carbons are too small to carry such currents through their entire length, so the current is applied to the carbons close to the arc in *regular* H.I. arcs; or the carbons are copper-plated, as in "simplified" H.I. arcs.

The comparatively great depth of the H.I. crater helps stabilize the luminous gas ball, but it also limits the amount of current which may be applied to the arc. If heat is generated in the crater faster than the carbon itself can carry it off, the crater burns back so far that the electrons take a shorter path to the positive carbon. They enter the hard shell surrounding the core; and when they do this the arc is said to be *overloaded*—it sputters and gives a flickering light.

Well, why not help the positive carbon get rid of its heat so that higher currents may be employed to give higher temperatures on the crater

(Continued on page 28)

Wendt House Party for Harry H. Strong



The Wendt party gang at ease — mugging the camera as usual. Left to right: Bill Gedris, Al Beaudouris, Fred Matthews, and Frank Kuehnle; seated: Harry Strong, Erwin Wagner, Harold Wendt, and Bert Martin.

HOW do theatre equipment manufacturers relax when they manage a few hours off from their business? Well, here is how eight of them, from various parts of the country, "played" when they gathered recently to honor one of their most prominent members. They ate 30 pounds of lobster, shuffled the pasteboards and reminiesced, for the most part.

Deserting their businesses for 36 hours, the men gathered at the home of Harold F. Wendt, head of Wendt Advertising Agency, Toledo, on January 15-16 to honor Harry H. Strong, president of The Strong Electric Co., Toledo, manufacturers of projection arc-lamps, rectifiers, reflector mirrors and other projection equipment, upon his retirement as a director of the Theatre Equipment Supply Manufacturers Association, (TESMA).

All Guests Equipment Notables

The Association staged its first trade show in 1946 in the Secor Hotel in Toledo. Between 40 and 45 equipment manufacturers were present. Today there is but one hotel in the country—the Conrad Hilton, Chicago—large enough to accomodate all the members and exhibits under one roof.



Harry Strong, dean of American projection equipment manufacturers, and Harold Wendt, his advertising and public relations counsellor for the past 30 years.

Those present at the Wendt lobster party included Fred Matthews current president of TESMA and also president of Motiograph, Inc., Chicago, the oldest manufacturers of motion picture projectors in America; Erwin Wagner, of Chicago, president of Wagner Sign Service, Inc., manufacturers of theatre marquee and other signs; William Gedris, Grand Rapids, Mich., president of Ideal Seating Co., manufacturers of theatre seating; and Al Boudouris of Toledo, president of Theatre Equipment Co. and Eprad, Inc., manufacturers of in-car speakers, and operator of the New Miracle Mile Drive-in and other drive-ins in Ohio, Michigan and Indiana.

Collectively they could write a documentary of the industry, from an equipment standpoint, virtually from the first "flicker" up to the present time. Mr. Strong is recognized as the dean of equipment manufacturers as well as one one of the country's outstanding projection lighting engineers. Also present, naturally, was the host, Harold Wendt, and Frank Kuehnle of the Wendt Agency. Present too, was James Strong, son of Harry Strong, whose talent for photography has won his many awards.

Allied Drive-In Convention

A number of projectionists attended the technical sessions and exhibits at the second annual National Allied Drive-In Theatre Convention held earlier this month at the Chase Hotel in St. Louis.

This gathering, which examines the many problems of the fast-growing drive-in industry, is becoming increasingly important. Among exhibitors this year were Altec Service Co., Hertner Electric, Motiograph, National Theatre Supply, Projection Optics, J. E. Robin, and The Strong Electric Corp.

LETTERS TO THE EDITOR

The appended commentary from a practical projectionist points up a very pressing problem, the solution of which, IP hopes, is also included.

LATELY I have had considerable trouble with CinemaScope prints damaged as indicated on the enclosed samples from *all* six reels. I believe that this damage is caused when the slack was not taken up by the top spindle, which is similar to the quick-start RCA action on the bottom sprocket when the lower spindle was not tight enough.

Once this difficulty ensues, and the section of film is not taken out, the film will slip a couple of sprocket teeth in the magnetic pickup — which requires a complete stoppage to take up this slack.

It requires only a little better care on the part of all concerned to prevent this damage, thus the reason for my directing your attention to this matter.

ALBERT H. FEGAN
IA Local 428, Stockton, California.

From 20th Century-Fox comes this interesting commentary.

Mr. Fegan is quite right. The leader damage is the result of fast takeups, small-cored reels, and carelessness in leaving slack in the upper magazine. If all projectionists were as careful as Mr. Fegan seems to be, we would have much less leader replacement in our exchanges.

Equipment-wise, using the large-hub reels with proper hold-back and takeup tensions, and motors of reasonable acceleration, will go a long way toward correcting this trouble. This assumes, of course, that the projectionist takes out the slack film when he threads-up, and also that the sprocket teeth are in good condition.

On our part, we are alerting all our exchanges to replace the damaged leaders.

From IP's corner the following:

The nuisance of torn perforations in leaders is by no means confined to CinemaScope magnetic-sound film prints. While performation damage is more prevalent with this type of print, because of the greater "tearing action" of the somewhat smaller CinemaScope sprocket teeth, the trouble which forms the basis of Mr. Fegan's complaint has been with us ever since Nickelodeon days.

Mr. Fegan has correctly pin-pointed the source of leader damage — the failure to take up the slack in the film between top reel and upper sprocket (or CinemaScope penthouse reproducer) and between lower sprocket and bottom reel. Please, fellows, remove this slack before switching on the projector motor!

Another Important Factor

There is one other cause of torn leader sprocket-holes to be considered. When the slack in the film between the optical soundhead and lower reel is taken up, too vigorous turning of the reel may bring the film up tight with a snap. And what usually happens? The teeth of the hold-back sprocket of the optical soundhead rip through the perforations.

This frequent source of leader damage can be avoided by holding the film firmly between thumb and forefinger of the left hand at a point just below the hold-back sprocket. Then, when the lower reel is given a spin, the film does not tighten up directly against the sprocket teeth.

Projectionist Aid Solicited

To the Editor of IP:

IP first came to me in Australia in 1929, and it has followed me to 30 countries since then. Your articles have always excited intense interest on my part.

As a manufacturer and distributor of projection equipment for many years, I have come to value and respect the opinions of the projectionist craft. I think that at the moment one of the most pressing projection problems is power supply for the larger arclamps needed for big-screen picture presentations in both indoor and drive-in operations. To this end I solicit the suggestion of projectionists as to any refinement which will contribute to greater ease of operation and more durability for such units.

M. D. FAIGE
Norpat Sales, 113 W. 42nd St., N. Y. City

V-V "Squeezed" Prints

To the Editor of IP:

In the December last issue of IP on page 12 there appeared an article by Loren Ryder which announced that Paramount would have anamorphic squeezed prints for any theatre which desired to use them. When we asked for such a print of "White Christmas," the Paramount exchange in Indianapolis informed us that Par did not make such prints.

Please check on this matter for us. We enjoy the wonderful articles appearing in IP.

A. M. AND G. FORD
Carmel Theatre, Carmel, Indiana

The reply to the foregoing is by Loren L. Ryder, Head of Engineering and Recording for Paramount Studios, Hollywood:

There has been no change in Paramount policy. Anamorphic prints will be made available on our VistaVision pictures for use in theatres where such prints can prove of value. Such prints will be prepared as soon as all the necessary transfer and printing lenses are in operation. Paramount exchanges will be advised at that time.

IP Kudo From India

To the Editor of IP:

Many of our projectionists in India are almost totally unaware of the construction and operating details relative to the various new film processes introduced within the past two years, because they have no access to the requisite literature.

I personally am in the fortunate position of having become aware of IP, and I may say that this is the only medium through which I have been able to keep abreast of all these new developments. I enjoy projection work, but I should have been seriously handicapped were it not for the invaluable information I received through your magazine.

V. S. JOSHI
Dadar, Bombay 28, India

BUY U. S. SAVINGS BONDS

In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

Buttressing IP's oft-repeated declaration that the so-called "transitory" phase through which the motion picture industry is now passing is basically a technological revolution is the appended official statement by Dr. John Frayne, director of engineering for Westrex Corp. on the recording end in Hollywood, and president of the SMPTE:

DR. JOHN G. FRAYNE, announced the Society's plan to establish a committee to look in to the problem of the growing need for *trained technical people* in the motion picture industry.

Dr. Frayne explained that the motion picture industry is becoming more and more *technical*, and that work that once could be done by unskilled people is now too complicated and requires the skill of trained personnel. Realizing this, and the ever-increasing need for trained people to replace present skilled personnel who are approaching retirement age, the Board of Governors of the Society, recommended that Dr. Frayne appoint a committee to look into the situation and recommend ways in which they could aid in building a reserve of technically-minded manpower.

The committee, which will include people from all phases of the industry, will attempt to determine where the need for more people with better technical education is greatest.

Evidence of wide-spread industry acceptance of the foregoing, is the following excerpt from an editorial by Chester A. Bahn, editor of the "Film Daily," which is primarily concerned with distribution and exhibitor interests.

Events of the last two years certainly have established beyond the shadow of a doubt that the future of this industry rests firmly on its ability to progress technically, and at a steady rate. Our previous policy—if it can be called that! —of stirring into action only when a crisis arises has cost us a pretty sum, not in pennies but in millions.

Further comment anent the foregoing by this department would be superfluous.

• IP views with considerable satisfaction the successful joint endeavor by Wisconsin Locals 606 (Wausau) and 722 (Wisconsin Rapids) in their fight to maintain the two-men-per-shift projection crews at the Fox and Lyric Theatres in Stevens Point, Wis. This item is deliberately positioned here so that it may provide immediate contrast with the preceding article relating to the urgent need for technological know-how.

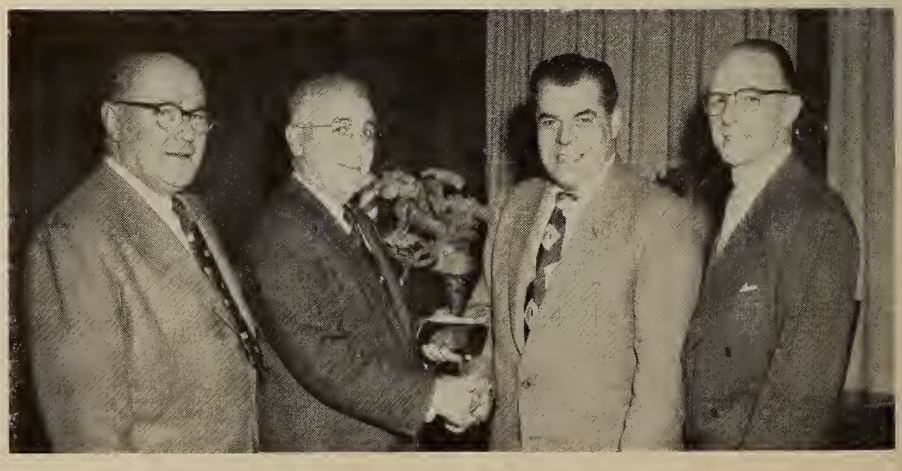
In IP's book technological know-how has always been translated in terms of adequate manpower, therefore it comes as somewhat of a shock to this department to hear the recent anguished outcries of exhibitors who wish to introduce new and complicated processes and at the same time *reduce* the manpower in the projection room necessary to obtain the best results.

IA Locals 606 and 722 fought and won the battle for the maintenance of adequate manpower on the basis of public safety and theatre construction (non-fire proof). Also introduced in the Local's argument before the City Council at Stevens Point, where the hearings were held, was the relative degree of "safety" as between acetate and nitrate film.

Safety Film Characteristics

While IP recognizes the basic safety advantages stemming from the use of acetate film, it may not in all candor be denied that this film base when subjected to the present high-intensity light sources will buckle and probably curl. Slow burning though this acetate base be, the fact remains that its instantaneous decomposition under the withering rays of present-day arclamp light sources will be visually apparent via the screen image

GENE ATKINSON, LOCAL 110, HONORED BY SISTER LOCAL



Eugene Atkinson (second from left), business representative for Chicago Local 110, receives a gold honorary life membership card in Film Laboratory Technicians Local 780, Chicago. Arthur W. Beeman (second from right), business representative for Local 760, made the award on behalf of the Local in recognition of the invaluable services rendered by Atkinson in building it from a mere handful of members when it was founded ten years ago, to its present status as a thriving IA Local with jurisdiction in the central United States from the Canadian border to the Gulf of Mexico. Atkinson served as a voluntary business representative for the Technicians' Local during its infancy, negotiating contracts and acting in an advisory capacity. Witnessing the presentation are Clarence Jalas (extreme left), secretary-treasurer of Local 110, and Walter Vance, member of Local 780.

to the audience. This being so, and it is, the element of danger resulting from panic in the audience still is ever present.

Summaries of recent appeals to civic authorities which have resulted in a reduction in projection room manpower have left this department a little woozy, for the reasons aforementioned. In such situations there is absolutely no sense in appealing to the exhibitors' state of mind for best presentation results; they'll have none of it.

Appearing for Local 606 were Woodward Bierbrauer, business representative; Lawrence Jacobson, vice-president; Lawrence Goodnow, secretary-treasurer, and attorney Herman J. Glinski. George Jacobson, business representative, appeared for Local 722.



Merle Chamberlin, projection supervisar, M-G-M Studios

• Merle Chamberlin, member of Hollywood Local 165 and projection supervisor at the M-G-M Studios, Culver City, Calif., was recently elected president of the M-G-M Studio Club. Dore Schary and E. J. Mannix are among the studio personnel serving on the newly-elected board of governors. Speaking for the board, Chamberlin stated that a new and enlarged program of service to the Club members was its goal and he urged the members to present their ideas or suggestions for improved services of the various committees.

• The annual mid-winter meeting of the IA General Executive Board was held at the Royal Connaught Hotel in Hamilton, Ont., Canada the week of February 14.

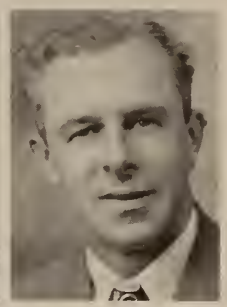
• One of the out-of-town visitors to the offices of IP last month was Roy Fisher, member of Rochester Local 253, who made a special trip to our city to attend the installation of officers of the 25-30 Club. Fisher, who developed and manufactures the popular Ethyloid film cement, as well as other projection room items, reported that business was booming. Fisher has retired from projection work and is devoting all his time to his flourishing business.

• As the result of a recent election conducted by the NLRB, Cameramens Local 644, IATSE, was chosen as the bargaining agent by film cameramen of the Columbia Broadcasting System in the New York area. Previously representing cameramen of all other networks, the IA two years ago signed a national contract with CBS, but this could not apply to the New York group inasmuch as it was already under contract as part of a Tv engineering unit represented by the IBEW. However, upon the expiration of the IBEW contract last May, Local 644, assisted by the International general office petitioned the NLRB to establish a separate voting unit for film cameramen, sound men, and lighting men at CBS. The Board, finding that the work of this group was "separate and functionally distinct" from that of Tv engineers, granted this request and ordered the election which resulted in an IA victory.

• Two IA men, Murray J. Nugent and Lawrence Sabatino, members of Local 650, Westchester Co., N. Y., were elected officers of the Westchester County Federation of Labor. Nugent was elected trustee and Sabatino will serve as financial secretary-treasurer for a two-year period.



Lawrence Sabatino



Murray Nugent

• The Georgas Brothers, Jim and Bill, members of Toronto, Local 173, have become almost lengendary in Canadian skiing circles by their trophy-winning feats. At the first major ski meet of the winter, which was sponsored by the Huntsville Ski Club (Ont.) last month, Jim Georgas won practically every contest. He won the four-way championship for the second year in a row as the meet's best all-around skier. He also won by wide margins the Nordic (jumping and cross-country) combined, and the Alpine (downhill and slalom) combined. In addition, he won the slalom race through a minor blizzard in the afternoon meet, and placed second in the downhill and cross-country.

Jim Georgas plans to retire from competitive skiing at the end of the ski season and join his brothers in teaching the sport to youngsters—that is, unless he is chosen for the

CELEBRANTS AT BRANTFORD, ONT. LOCAL 582 ANNIVERSARY



More than 100 people attended the dinner-dance tendered by Local 582, Brantford, Ont., Canada, in the Caronation Room of the Brant Hotel in that city in commemoration of the Local's 35th anniversary. Shown above, left to right, are some of the personages attending the event: Charles Ward, alderman of the city of Brantford; Len Tyler, Local 582 president; Hugh J. Sedgwick, IA fifth vice-president; Reg. Truckle, the only remaining charter member of the Local, and Lou Lodge, secretary of District No. 11 and of Toronto Local 173.

Olympic ski team. "If I can make the Olympic," he said, "then I'll know I'm still good enough to beat the best in the country."

• Local 337, Utica, N. Y. recently concluded negotiations with the Kallet Theatres in Utica, and signed new three-year contracts calling for a 3% increase in wages for its members for the first year, and an additional 3% for each of the following two years. Among the benefits covered in the new contracts are two weeks vacation with pay for all projectionists, and time-and-a-half for overtime. The Local also signed a new contract with Warner Bros. Theatres, obtaining a 15% increase extending over a five-year period, plus paid vacations and time-and-a-half for overtime.

Harry Lackey, business representative for Local 337, served as chairman of the wage committee negotiating the contracts and was ably assisted by John Stuczko. Lackey reported that Utica is now 100% organized.

• Frank Pircher, veteran member of Local 306, retired last month from his job as projectionist at Loew's Victoria Theatre in New York City, where he worked for the past 27 years.

When asked what he planned to do upon his retirement, Pircher stated that he hoped to spend a great deal of his time studying the classics. "All my life I have either been studying or working in the fields of science or engineering," said Pircher, " and I somehow have the feeling that scientific progress is coming so fast that we have not had time to adjust ourselves to it. That is why I should like to read about the ideas of men who lived in the past when people were closer to reality." The re-reading of Shakespeare's plays and the works of Voltaire and Walt Whitman are also part of Pircher's program of study.

Frank Pircher came to this country from Austria as a lad of 14. He attended Cooper Union in New York City and was graduated in the early 1900's with a degree of Bachelor of Science in Electrical Engineering. Shortly thereafter he worked for the Consolidated Edison Co. of N. Y. as a supervising engineer. This was the era when electricity was coming into wide use in both industry and the home. Power lines often proved inadequate for the loads they had to carry. For instance, very often when a projectionist struck the arc in one of the early lamps, the lights in neighboring stores would go out. It



Frank Pircher, member of Local 306, New York City

was Pircher's job to trace the source of the trouble and to remedy it. Eventually he became interested in motion pictures and shortly after World War I he joined Local 306 and got his first job as a projectionist, working steadily at the craft until his retirement.

More agile than a far younger man, Pircher looks much younger than his 78 years. Climbing up to the almost inaccessible projection room at the big Loew's Victoria Theatre, which can be entered only by the climbing of stairs, steel ladders, and crossing a catwalk between the ceiling and the roof of the theatre, taxes the efforts of much younger men but to Pircher it was all part of the daily routine and he took it in his stride.

• The 25-30 Club held its annual installation and banquet last month with the usual large turnout. Many members and guests from out-of-town, including representatives from leading projection equipment manufacturers, were present at the affair.

After the installation ceremonies, the Club presented gifts to several of its officials for service rendered during the past year. Abraham Kessler, the outgoing president, was presented with an oil portrait of himself. Benjamen Stern, financial secretary, received a gold pen and pencil set; Morris I. Klapholz, recording-secretary, was given two pieces of luggage, and Morris J. Rotker, who was master of ceremonies at the banquet and the installing officer, was also presented with luggage. Jacob S. Winick, the newly elected president of the Club, was presented with an ivory gavel by Ernie Lang, who made the presentation on behalf of the Projectionists Square Club. Souvenirs of Paper Mate pens and 1955 pocket diaries were distributed to the guests.

Among the honored guests were Arthur Meyer, International Projector Corp.; Allen G. Smith, National Theatre Supply; Arthur Hatch, Strong Electric Corp.; Paul Reis, National Carbon Co.; Mike Springer, for RCA, and Joe Hornstein, Jr., of the Hornstein Theatre Supply. Out-of-town members included Roy Fisher, Local 253, Rochester; Harry Lackey, Utica Local 337; Edward LaBadie, Syracuse Local 376; Al DeTitta, Ed Dougherty, John Coutolli, Ralph DeMea, and Tony Boscorelli, members of Local 384, Hudson County, N. J. New York Local 306 was represented by a delegation including Ernie Lang, Izzy Schwartz, Al Kunze, Steve DeInzillo, Harry Garfman, and Charles F. Eichhorn.

IP was represented by James J. Finn, editor, and James Morris, associate editor.

IA OBITUARIES

JULIAN ANTHONY, 67, veteran member of St. Louis Local 143, died of a heart attack last month. He joined the Local in 1915 and worked in many of the theatres in and around St. Louis. His son, Norman, also a member of the Local, survives him.

CARROLL G. BAYNE, 66, business representative for Baltimore Local 181 for the past 8 years, died recently. A member of Local 181 since 1912, he worked at the Stanley Theatre in Baltimore for 26 years. He was a delegate for many years to the Baltimore Federation of Labor and also represented the Local at IA Conventions. He was active politically, being associated with the Democratic organization in his district. Carroll Bayne was a veteran of World War I, serving in the U. S. Navy. He was buried in the National Cemetery in Baltimore.

New Victor AC Offices in N. Y.

Victor Animatograph Corp., with home offices in Davenport, Iowa, announces that increased sales, manufacturing and export activities its New York City offices have been moved to larger quarters at 200 West 57th St. and there consolidated with its Latin American division. Horace Jones, vice-president, is in charge.

More CinemaScope for Britain

There are now more than 500 CinemaScope installations in England, and these installations will soon equal those in the United States in the ratio of CinemaScope-equipped theatres and population. So announces 20th Century-Fox.

New Cinerama Feature Opens in N. Y.

THE new Cinerama feature, "Cinerama Holiday," opened in New York this month with both film critics and public registering enthusiastic approval. The new feature differs from the first Cinerama production in that it is not a series of unrelated scenes. All of the sequences are tied together by making it an account of the travels of two young couples on vacation.

Since the technology of the three-projector Cinerama system is well known and has not been altered in any important way for this new presentation, an account of the projection details need not be repeated. Appended are the comments of Bosley Crowther, eminent film critic of the *New York Times*:

"As with the first bill, '*This Is Cinerama*,' the present program is essentially a show of exciting and colorful outdoor action incidents and grand scenic spectacles. Only this time the hodge-podge of material is strung on the wisp of a story line, which has the incidents and spectacles encountered as the experiences of two sight-seeing couples, one traveling in the United States and the other traveling abroad . . . The second half of the program is picked up with a thrilling, climactic sequence, taken from the cockpits of jet fighter planes doing aerial acrobatics and landing on an aircraft carrier's deck.

"By far the most dazzling experiences visualized on the giant screen—once the Cinerama spectacle is opened with a breath-taking airplane view of Alpine terrain—are some grand and exhilarating moments of skiing and a heart-thumping plunge aboard a bobsled. This latter episode with its accompaniment of sounds of screaming runners and rushing wind is something to put the new familiar roller-coaster ride of '*This Is Cinerama*' in the shade.

Improved Technique Apparent

"From the point of technical perfection, '*Cinerama Holiday*' manifests many improvements over the initial program. The cameras are much more mobile, giving a greater flexibility and fluidity to the action scenes, and more freedom at 'panning' and cutting makes for a smoother cinematic flow. While overlapping within the giant panel of the images thrown by the three projectors is evident at times, the synchronization of the composite image is generally improved.

"To be sure, the giant screen still looks distorted to those sitting in the outer fringe of seats, but the optical experience is still novel, however foreshortened and bizarre.

"Conglomerate and random though it may be, '*Cinerama Holiday*' is a dandy show."

New Ampex Sound System for All Theatre Needs

A theater sound system capable of reproducing CinemaScope magnetic stereophonic sound, single-track magnetic sound, single-track optical sound and Perspecta Sound is now being marketed by Ampex Corp., Redwood City, Calif.

In announcing the availability of the combined optical—magnetic system, Jim Mahon, theater equipment sales manager, said the price for a complete system, including all facilities for three-track CinemaScope sound, was about equal to the cost of simply replacing the aging, single track optical sound systems still used in many theaters.

"For little more than what he spends in replacing worn-out optical sound equipment with modern high-fidelity amplifiers and speakers, the theatre owner can now have facilities for playing every type soundtrack in existence," Mahon said. "The new Ampex optical-magnetic system replaces all sound equipment currently in the projection room except the optical soundheads and the power supplies for the p.e. cells."

Perspecta Integrator Available

As supplied by Ampex, unless specially ordered, the system does not include the integrator needed for Perspecta sound. However, complete switching facilities for Perspecta are provided so that only the addition of the integrator is necessary. The integrator is available from Ampex at extra cost.

A single box mounted on the front wall of the projection room provides facilities for selecting magnetic, optical, Perspecta or phonograph sound; for changeover between projectors, and for controlling sound volume.

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Are you planning to change your address? If so, please notify our circulation department one month in advance. The Post Office does not forward magazines mailed to a wrong address. To avoid confusion and delay, please cooperate by sending us both your *new* and your *old* address.

RCA Has Record Income Year

RCA did the largest volume of business in its history during 1954. RCA manufactures a full line of both 35- and 16-mm projectors and sound equipment in addition to theatre Tv equipment, Tv sets and other electronic products. It also owns the NBC Tv network.

Sales of products and services by RCA in 1954 amounted to approximately $930,000,000. Net profit before federal income taxes will be approximately $84,000,000 and after taxes approximately $40,000,000. The 1953 gross of the company was $853,054,000. Net profit was $72,437,000 before taxes, and was $35,022,000 after taxes.

Major Developments in 1954

Listed as major developments during 1954 were compatible color Tv, the RCA 21-inch color tube and a new Tv color receiver using it, the RCA magnetic Tv tape recorder, electronic light, electronic light amplifier, transistors and high fidelity record players.

The 1955 production of Tv receivers is estimated at 6,000,000, increasing the total number in the U. S. to about 38,000,000 by the end of the year.

At the opening of 1955, there will be more than 420 Tv stations in operation in the U. S., 140 of which will be equipped to handle network color programs. More than 90 new Tv stations began operating in this country during 1954. In Canada, 26 Tv stations are expected to be on the air by early 1955.

Portent of Progress?

Century Circuit of N. Y. City, one of the largest in the nation, reports that its business is better by far this year than in 1953. Improvements in business is attributed by circuit executives to fine factors as follows:

1—Better pictures.

2—Ticket tax relief.

3—Income tax cut, which makes more spending money available to the public.

4—Technological advances, which have caused "tremendous talk" and revived public interest in motion pictures.

5—"The magic of Tv has worn off." Says Century: "in the long run Tv will do more than anything else to help the industry."

PERSONAL NOTES

HANS TIESLER, for the past three years associate producer for Loucks & Norling Studios, N. Y. City, has been elected vice-president and a director of the company, it is announced by John A. Norling, president. Tiesler succeeds Will Marcus, who has resigned his executive position but will retain connection with the company on a consulting basis.

The company, founded in 1924, has a score of technical "firsts" to its credit, including the famed 3-D "Audiscopics" of 25 years ago. It now produces films for industrial and television purposes.

R. D. FAIRBANKS, who has been with Altec since 1937 and lately an engineering specialist at their Boston northeastern office, has been transferred to Altec's New York headquarters to carry out a special assignment in connection with a classified electronics project for the U. S. Navy.

A saga of American industrial life was written recently when two erstwhile messenger boys were named to top executive posts of a bell-weather and internationally-known business enterprise. The company—Bausch & Lomb Optical Co.; the men—CARL S. HALLAUER, newly-elected president of the company, and his predecessor, JOSEPH F. TAYLOR, who is now chairman of the board.



Carl Hallauer (left) president, and Joseph F. Taylor, chairman of the board, of Bausch & Lomb Optical Co.

Mr. Hallauer, who started his business career as a newsboy when he was orphaned at the age of nine, has been executive vice-president of B & L since 1952. He joined the firm as industrial relations director in 1918. He is also president of Bausch & Lomb, Ltd. of Canada, and Bausch & Lomb do Brasil Ltd., the firm's South American subsidiary.

Mr. Taylor, president of the company since 1949, began his career with the company in 1910 as an errand boy. M. HERBERT EISENHART, former board chairman, was named honorary chairman.

J. F. ("JACK") O'BRIEN, widely known throughout the theatre equipment field during his 24-year career with RCA, has been appointed manager of the Theatre and Industrial Marketing Department of the company's Engineering Products Division. He succeeds George L. McKenna, resigned.

For the past several years manager of RCA Theatre Equipment, with headquarters in Camden, N. J., O'Brien now assumes responsibility for the products planning, marketing and sales of RCA theatre products, industrial and scientific equipment, film-recording apparatus, sound equipment and "Tv Eye" closed-circuit industrial Tv systems.

O'Brien joined RCA in 1931 and has served as field sales representative in such important markets as Hollywood, St. Louis, Chicago and Boston. In 1951 he was advanced to sales manager. A native of Buffalo, N. Y., he is a New York University alumnus.

HAROLD BROWN has been named vice-president in charge of sales for The Strong Electric Corp., Toledo, Ohio. Mr.



Harold E. Brown, v-p in charge of sales for The Strong Electric Corp.

Brown joined the Strong organization in 1935 after a tour of duty with General Electric. He will be in charge of sales of projection arclamps, rectifiers, spotlamps, slide projectors, and reflectors.

Improved Optics, Light Output For Strong "135" Lamp

The Strong Electric Corp. has announced that its Super "135" projection arclamp, equipped with an 18-inch diameter F/1.7 reflector, will be available to theatres with F/1.8, F/1.7, or F/1.5 objective systems and projectors cleared these high-speed optical systems. The Super 135 lamps will also continue to be offered with a 16½-inch diameter F/1.9 reflector.

With this 18-inch diameter F/1.7 reflector and matching high-speed objective lens system, a total of 31,000 lumens can be projected through a standard 0.825 X 0.600 aperture, or 38,000 lumens through a CinemaScope magnetic sound aperture, using 10-mm Hitex carbons at 135 amperes. This light output is asserted by Strong to be the highest that can be presently attained for big-screen presentations.

Improved Carbon Contact

All Super 135 lamps, with either size reflector, will be available for 9-, 10- or 11-mm regular trims as well as 10-mm Hitex operation and will feature an improved positive carbon contact that has proved outstanding in life tests in several "grind" houses. Hereafter they will also be equipped with a new ventilated reflector frame to insure cool operation of the reflector and rear section of the lamp even at extreme angles of projection.

Special Blower Cooling Fan

Simultaneously with this announcement, Strong also stated that all future Super 135 lamps will be provided with a special blower fan for keeping the Strong Infra Ban Beam Cooler at a lower operating temperature by removing the light energy which is neither reflected nor transmitted but is trapped in the filter itself.

This beam cooler and blower will provide improved means for removing and dissipating the unwanted portions of energy from the light beam before it reaches the aperture. These new model lamps will also have the filter mounted on a removable holder for quick removal and ease of cleaning.

"Camera Talk" Photo Bulletin

"Camera Talk" is a breezy, informative little publication now being published by Camera Equipment Co., 1600 Broadway, New York City, 19. Designed expressly for all those interested in photography, whether professional or amateur, this booklet which is published at regular intervals contains valuable data on both equipment and technique.

"Camera Talk" will be sent free of charge to anyone in the industry upon application to CE.

Electronic Synthetic Music

An electronic music synthesizer, capable of generating tones beyond the range of a voice or an instrument, has been developed in RCA experimental laboratories. The device makes it possible, for instance, to simulate an entire orchestra by pressing typewriter-like keys that actuate electron tubes and transistors.

50% Jump in Loew Profits

The 50th anniversary report of Loew's, Inc. and its theatre subsidiaries showed a net profit of $6,577,311 for the fiscal year ended Aug. 31, 1954. This is an increase of $2,196,707, or 50%, over the previous year.

An interim financial statement sent to stockholders with the annual report shows that for 12 weeks ended Nov. 25, 1954, the net of Loew's and all subsidiaries amounted to $1,521,349 after all taxes and charges, subject to year-end adjustment. This is equivalent to 30 cents per share, compared with $1,133,893, or 22 cents per share, for the same period of the preceding year.

Profit before taxes for the 1954 fiscal year was $12,643,840, compared with $6,435,504 in the previous year. Operating revenues were $183,142,486, compared with $177,588,874 in 1953.

New U-I Release in 3-D

Any theatres interested in giving 3-D another chance will soon have an opportunity. Universal-International announces that they will have dual prints available for two-projector 3-D presentation of the feature, "Revenge of the Creature," now being released. The picture can be shown either "flat" or in 3-D, as desired.

1A ELECTIONS

LOCAL 304, WATERBURY, CONN.

Thomas Gandy, *pres.;* Joseph Mazeika, *vice-pres.;* Frank Carey, *sec.-treas.;* Francis LaFalmme, *corr.-sec.;* Ralph Di Pietro, *bus. rep.;* Harold Berger, *sgt.-at-arms.*

LOCAL 380, OKLAHOMA CITY, OKLA.

Bert Bell, *pres.;* W. R. White, *vice-pres.;* Berlin Parks, *sec.;* Kenneth Lyons, *bus. rep.;* R. G. Boyer, *sgt.-at-arms;* Omar Woodard, Verne Thorne, and Floyd Harcum, *trustees.*

LOCAL 332, CLINTON, IOWA

Harold Andrews, *pres.;* Charles Tintey, *vice-pres.;* A. E. Hubbard, *sec.-treas.;* Paul Nadelhoffer, *bus. rep.;* Ronald Dierks, *sgt.-at-arms,* and Charles Snyder, *trustee.*

LOCAL 407, SAN ANTONIO, TEX.

Genaro G. Garcia, *pres.;* Alfred Pena, *vice-pres.;* Henry Villapadierna, *sec.-treas.;* Horace E. Blanton, *rec.-sec.;* John D. Dennis, *bus. rep.;* Phillip N. Wehrmann, Manuel Ayala, *members at large;* Manuel Perales, J. W. Good, and Joe Sanches, *trustees.*

LOCAL 414, WICHITA, KANS.

H. I. Phillips, *pres.;* Benton E. Swart, *vice-pres.;* Edward J. Storey, *sec.;* C. H. Winslow, *treas.;* E. L. Jeffress, *bus. rep.;* M. L. Geiger, *sgt.-at-arms.*

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60-DEGREE INTERMITTENT?

(Continued from page 10)

loop. As soon as the film stops moving in the aperture, the feed sprocket begins to feed film in to rebuild the loop.

With the 2-3 timing, the rubber pad is made to move up and down about 1/16 inch so as to correspond with the two different sizes of loops. In framing, the pad also moves up and down to follow the loops.

IP Comment Upon Jackson Intermittents

THE oscillating-cam Geneva intermittent movements devised and tested by J. G. Jackson are ingenious and entirely satisfactory. Especially noteworthy is the fact that several modifications of this type of movement are possible to give almost any desired pull-down speed and "dwell" timing. Thus Jackson's intermittents lend themselves admirably to all conceivable theatre, commercial, and television applications.

A very attractive feature of these movements is, of course, the standard 4-slotted starwheel and standard 16-tooth, 35-mm sprocket. Performance should be quiet and rock-steady. Then, too, no difficulty would be encountered in adapting these movements to 16-mm applications, it being necessary only to substitute a 4-tooth, 16-mm sprocket for the 35-mm sprocket.

Worthy of Serious Study; 5:1 Especially Noteworthy

Jackson's description of these intermittents is worthy of the most serious study. To avoid confusion in visualizing the mechanical functioning, we should bear in mind that the drive gear which slides the double-faced cam back and forth makes 3 turns for each revolution of the spline shaft (Figs. 1 and 2). Thus each of the two cam pins engages a starwheel slot only once during every 2 revolutions of the cam.

The 5 to 1 movement shown in Fig. 1 represents a marvelous solution of two serious present projection problems: insufficient light in some theatres, and flicker due to too much light in others. When a 2-cutoff shutter is used with a 5 to 1 movement, the shutter blades can be trimmed down to as little as 60 degrees before travel-ghost shows up. This makes possible a light-transmission of 66.67%; whereas the maximum transmission for the ordinary 3 to 1 intermittent movement is only 50%. (To get a transmission of 71.6% with his 5:1 movement, Jackson trimmed his shutter *just a bit* beyond the theoretical limit—a small point.)

When high-powered arcs are used in small theatres, the periodic interruption of the light-beam by the rotating shutter produces a visible flicker. But Tv has accustomed the public to extremely bright pictures!

5-to-1 Movement Outstanding

This is a problem easily licked by the 5 to 1 intermittent. With this intermittent a 3-cutoff shutter may be used. The result is 72 cutoffs per second instead of the usual 48—a frequency so high that no flicker can be seen even on the brightest screens. Because each blade of the 3-blade shutter covers 60 degrees, light transmission is 50%.

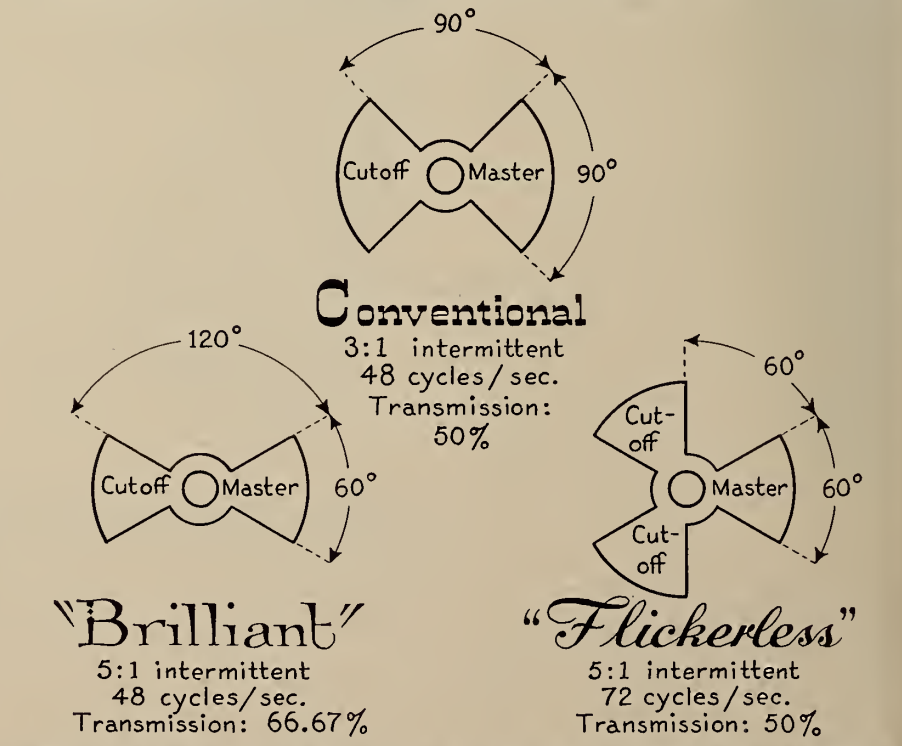
The 2-3-2-3 sequence of "dwell" periods required for Tv projection (60 fields per second) has been successfully engineered in the intermittent movements now in use in all but a few types of Tv projectors. These, whether "claw" or "sprocket" intermittents, are sometimes called "eccentric" movements in order to distinguish them from the standard "equal-rest" intermittents used in conventional optical projection.

The Jackson oscillating-cam Geneva movement shown in Fig. 2 is another mechanically sound intermittent of the eccentric type. Employing a standard 16-tooth, 35-mm intermittent sprocket, it provides a more satisfactory film-wrap and smoother transport than the 12-tooth sprocket used with the "divided pull-down," 2-pin non-oscillating cam type of eccentric intermittent. The "secret" of this intermittent lies in the slotted bracket which provides a non-uniform oscillation of the cam on the spline shaft.

Although the special slow-motion variant of Jackson's intermittent is interesting from a purely mechanical point of view, its commercial application would seem to be limited to printing machines.

Numerous Possibilities Seen; Film Pull-Down and Tension

The variations described by no means exhaust the possibilities of



The two-fold advantage in shutters which can be used with 5-to-1 intermittent movements. The "Brilliant" shutter has the same periodicity as the conventional shutter—48 cycles per second—but transmits much more light to the screen, making the picture brighter. The "Flickerless" shutter transmits the same amount of light as the conventional one, but its high frequency—72 cycles per second—frees pictures projected at high light levels from annoying shutter-flicker evident with intense light at 48 cycles per second.

Jackson's basic idea. By employing a 2 to 1 drive-gear ratio and only one pin in the oscillating cam, every 2 revolutions of the cam would give only 1 film pull-down. Thus modified, the movement diagrammed in Fig. 1 would operate at a 7 to 1 instead of a 5 to 1 pull-down ratio. A pull-down of even this great rapidity would be practical, permitting a light-transmission of 75% with a 2-cutoff shutter system (blades 45 degrees wide), or 62.5% with a 3-cutoff shutter for flickerless movies at even the highest light levels.

Film Pull-Down Ratio

Increased pull-down speed requires greater tension on the film in the gate to prevent overshooting, of course, and increased tension shortens the life of the film. It has been established, however, that a pull-down ratio as high as 8 to 1 can be used in 35-mm projection without reducing the life of release prints to such an extent that they would wear out before having served the normal number of runs.

The use of a sponge-rubber pad under the upper film-loop to prevent overshooting does not seem to be the best solution of an admittedly difficult problem. We are willing to accept Jackson's statement that the rubber stop works; but we can't help wondering if it causes excessive noise, produces unsteadiness of the image, or increases the likelihood of film breaks, especially if not positioned with extreme accuracy. Operation might be considerably simplified by eliminating the rubber stop and increasing gate tension.

Jackson's intermittent variations are devices of real merit and practicability. They are eminently worthy of the most serious consideration by all serious projection practitioners who are aware of the limitations of the ordinary 3 to 1 movement and of the demands of the times.

Par's VistaVision Print Projection Framing Index

Coincident with the release of the feature films "The Bridges at Toko-Ri" and "Three Ring Circus," Paramount is including a projection framing index card on the thread-up reel. All Paramount pictures are in the VistaVision process with Perspecta optical sound track.

Vebatim content of this framing index is as follows:

To assist projectionists in the proper framing of VistaVision prints Paramount has placed a framing index on each "A" (or thread-up) reel of the release print.

This framing index appears briefly twice in the upper right-hand corner of the projected image, first 12 feet after the start of the reel for 12 consecutive frames, and again 8 feet after the first appearance for 14 consecutive frames. On the screen, the symhol will look like this:

(1.66-1.75-1.85) —
— **(2.00)**

When the upper horizontal line extending to the LEFT is framed right to the top screen masking, the picture will be framed for 1.66-to-1, 1.75-to-1 or 1.85-to-1 aspect ratios. When the lower horizontal line extending to the RIGHT is framed to the top screen masking, the picture will be properly framed for a 2-to-1 aspect ratio.

As a further guide to the projectionist, each frame of the head leader of "A" (or thread-up) reels will carry a black rectangle, precisely placed to provide the proper head-room for the projected image in aspect ratios of 1.66-to-1, 1.75-to-1, and 1.85-to-1. The projectionist merely inserts in his projector an aperture plate in the desired ratio, and adjusts his frame control to center this black rectangle in the aperture when threading up. When the framing index appears on the projected image, he can check the framing and make such further minor adjustment as is required.

We need your help.

Eidophor Demonstration Near

A demonstration of the Eidophor system of theatre Tv is expected shortly, according to 20th Century-Fox engineers working on this Swiss system which is capable of filling a wide screen with both color and black-and-white pictures. They believe that they have eliminated a flicker problem which was holding up development.

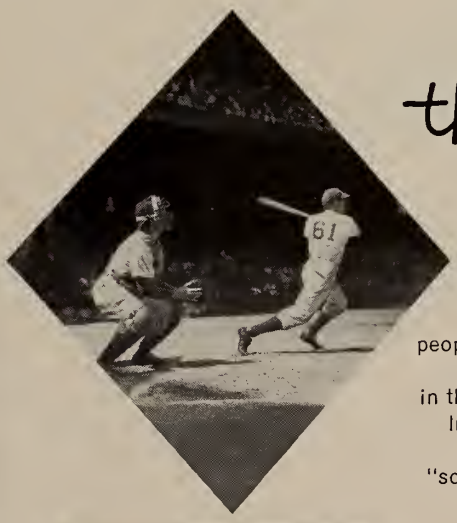
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Large-Core Lorraine Carbons

Because of the increasing need for more projection light and in anticipation of much larger apertures, Lorraine laboratories have begun enlarging the core area of their Orlux carbons.

While it is true that optical systems of present projection lamps are designed to have specific magnifications and speed, a large core area makes it possible to get the attainable quality of light even with this magnification of the arc, and in the newer lamps with faster optics the magnification of the action of the combustion of gases, taking place in the arc, is less prone to be discernable on the screen with a large core than with a small-core carbon.

Orlux carbons are now available with enlarged core area for purposes of greater coverage and steady brilliance in association with larger apertures, whether copper-coated carbons or the black 9-mm, 10-mm and 11-mm positive carbons are used, as well as with condenser lamps using the 13.6-mm positive trim. However, the full value of the large-core carbons will be realized only with the newer projection lamps that are being planned.

Tv's Effect on Ontario Biz

With the number of Tv sets in homes constantly rising, theatres in Ontario, Canada, have experienced an appreciable decline in boxoffice receipts in the years since 1951, with latest figures on yearly ticket sales showing a decline of 3,648,192 or 4% since 1951 despite a population gain of 20%.

In the areas of the province directly affected by the operation of Tv stations, admissions have declined even more sharply. In 242 theatres for which attendance figures are obtainable and which are located in Tv areas, there has been a drop in attendance between 1951 and 1954 of 11,219,868, or almost 21%.

Record Income for Universal

Record income and the highest net profit since 1946 has been reported by Universal Pictures Co. for the fiscal year ended Oct. 30, 1954. Film rentals and sales during this period brought $77,887,688. This is the highest sales volume in the company's history and compares with a volume of $70,490,254 for the preceding 12-month period.

Net profit for the 12 months ended Oct. 30 was $3,797,688, or $3.58 per share, compared with $2,616,356, or $2.35 per share, in the previous year.

Toll-Tv Opposition Organized

A committee of nationally-known exhibitors was formed recently to oppose strenuously attempts of various toll-Tv outfits to obtain approval from the Federal Communications Commission for their methods of collecting fees from home Tv owners for certain shows.

In a joint statement by Alfred Starr and Trueman Rembusch, co-chairman of the committee, it was declared that "the inherent fallacies in the arguments of the sponsors of toll-Tv must be exposed . . . The public must be informed that toll-Tv is economically unsound, that it will deprive the public of free Tv, and that it will create what is in effect a government-sponsored monopoly."

The exhibitor committee is raising $150,000 for the campaign.

Navy Buying Wide Screens

The U. S. Navy and Marine Corps. expect to install wide screens in all of their theatres during 1955 or else cease operations in theatres that can't be so converted. The Bureau of Ships has instituted a $400,000 wide-screen conversion program. Theatres for which funds are not allocated will be ordered closed.

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SMPTE Engineers to Attend Stockholm Standards Meet

In a move to assist world-wide adoption of standards for pictures made for the wide screen, the Society of Motion Picture and Television Engineers is sending a delegation to the meeting of the International Standards Organization in Stockholm next June, it was reported this month by Dr. John G. Frayne, president of the SMPTE.

The SMPTE party will be headed by Axel Jensen of Bell Laboratories. Henry Kogel, staff engineer of the SMPTE, will also make the trip. Jensen said that this attempt at coordination could be of great benefit to American film companies doing business abroad. The standards aimed at would apply to sprocket holes, film width, and soundtracks, for instance.

Other business at the SMPTE board meeting included formation of a committee to look into ways and means of improving the educational standards of people preparing for technical jobs in the motion picture business. This would probably involve working closely with schools, colleges and industry groups, including unions, to provide better training facilities.

Stanley Warner Profits Double

The Stanley Warner theatre chain has announced a net profit for the first quarter of its present fiscal year that is *more than double* that of the same period in the previous year. The net after all charges was $1,110,100, equivalent to 50 cents per share of 2,212,900 shares of common stock. This compares with a net of $523,100, or 21 cents a share, for the previous year.

The gross income for this first fiscal quarter, ending November 27, 1954, was $23,320,400. For the previous first quarter, the gross was $13,794,100. The higher earnings in the latter period are partly attributed to the operations of International Latex Corp., a garment manufacturing firm that Stanley Warner acquired as part of an investment diversification program.

Box-Office Lag Traced

The attractiveness of surrounding shopping areas was linked to the prosperity of motion picture theatres in a recent survey made by the Sindlinger organization, a research firm which specializes in the firm exhibition business.

Invited to make a survey in a small Texas town, Bonham, with three theatres and a population of 7,000, where the theatres found business slow despite investments for the new projection processes and air conditioning, the research firm found that the town's entire shopping and entertainment area was suffering from the fact that stores were generally backward and drab. Many potential customers were going to stores and theatres in neighboring towns.

Subscription Tv Suggested As Baseball Revenue Source

The Telemeter system of pay-as-you-see offers organized baseball the best means of promoting its own financial interests and of protecting minor leagues against attendance losses caused by telecasts of major league games, it was asserted this month by Paul MacNamara, vice-president of the International Telemeter Corp. A majority interest in Telemeter is owned by Paramount Pictures.

In the past it has made use of local theatres and the house-to-house coaxial cable links installed in localities having community antennas. This made it possible to charge for home Tv on an experimental basis without actually using the air waves and coming into conflict with FCC regulations.

Drive-in Air Conditioner

Individual weather-to-order for drive-in car occupants will be made available through a 25-cent slot machine to sell for $250 per car unit, plus 10% of the take. The Farr Amusement Co., of Houston, Texas, has developed a new coin-operated combination air conditioner and heater for drive-ins. The unit can be attached to the posts next to cars, and would help drive-ins in many sections of the country to operate year-round.

SPLICES NOT HOLDING ?

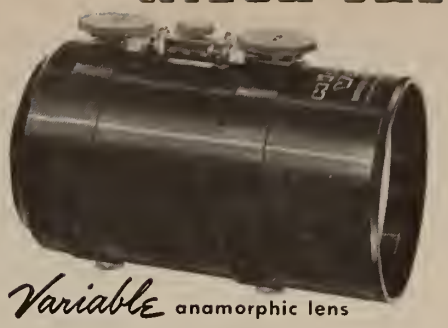
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(Continued from page 16)

floor, volatilize more flame material, and bombard these vaporized substances with a denser stream of electrons? The result, if this can be done, is a much brighter arc.

Use of Water-Cooled Jackets

This *can* be done, and the best way to do it is to surround the carbon-feeding jaws with water-cooled metal jackets. But several difficulties are at once encountered with this method. The first is a loss of about 15% of the energy fed to the arc. In other words, to get the same light as before, the current must be stepped up by about 15% when the positive carbon is effectively water-cooled.

Why is this? The water, by removing heat, also removes electrical energy which has been converted to heat—energy which *does not* brighten the arc, but merely raises the temperature of the water which cools the carbon. Current is therefore wasted.

This is not quite as bad as it may seem at first thought. The 15% loss, after all, is not too much. Also, the rate of consumption of the carbons decreases by about 10%, this saving helping to make up for the loss of electricity.

Up to this point our carbon coolers have deprived us of a modicum of screen illumination which, in a few instances, is desperately needed. Wouldn't it be better, at least in the drive-ins, to have current wasted instead of light? We can swap current for light, as previously suggested, by increasing the amperage by 15%, more or less. (This expedient may require us to use the next larger trim of carbons to avoid overload.)

Uniformity of Screen Light

Now that the light-level has been restored to its pre-cooler value, we may wonder just what, if anything, has been gained by using water-cooled carbon jaws. First of all, we notice that the arc burns more smoothly and gives a more uniform light on the screen. We've gained little or no light, and we're wasting current; but the light *is* better. Fewer color-changes at changeovers, too. All these niceties of projection, together with a cooler lamphouse, are to the credit of water-cooled jaws.

But perhaps it is more light that we really want. Will water-cooling allow us to use a current so far above the rated maximum current of our trim that the pictures become *noticeably* brighter? *NO!* not with regular or "super" (Hitex) H.I. positives.

'Refrigeration', Not 'Cooling'

The ordinary types of H.I. positive carbons have large cores and thin shells of harder carbon. It would require refrigeration, not mere water-cooling, to prevent destruction of the crater and loss of the gas-ball with overload currents. Actually, the ordinary H.I. positives *can* stand a *slight* "overload" when efficient water-cooling is used. But the increase in screen light obtained by taking advantage of the slight rise in the overload limit produced by water-cooling is negligible. A good light mere will reveal it, but no one in the audience will notice it.

Carbon Overloading Danger

It should be clear at this point that regular and "super" H.I. carbons burn with maximum efficiency without water-cooling. Equally obvious is that the *slight* increase in light obtained by slightly overloading water-cooled carbons introduces the risk of a real overload with consequent deterioration of screen light. All it takes to disturb such a souped-up arc is a line-surge or an accidentally-



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shortened arc gap—anything, in fact, that momentarily boosts the amperage.

The highest amperage employed in a water-cooled arc should never be more than 5% above the maximum rated current for the size of positive being used. Even this 5% allowance assumes *effective* cooling of the positive carbon. If a 15% boost in current is needed to restore normal light levels, then larger positives must be used.

The writer underscores these facts while also repeating our reminder that water-cooled arcs operate with remarkable stability and provide a more uniformly illuminated screen with smaller accidental color changes so long as the carbons (assumed to be standard or super-high) are not burned more than 5% above their normal current-rating. Certain proponents of carbon-cooling devices have told some "whoppers" in an effort to establish that water-cooling can increase the brightness of regular and super H.I. positives.

Baseless Claims Damaging

It has been asserted for example, that light-meter checks "prove" that water-cooling "increases the brightness of the picture." In one case the writer found that the uncooled arc used for comparison was deliberately overloaded: the carbon cooling merely removed sufficient energy from the arc to allow a gas-ball to be formed inside a symmetrical crater. The same level of screen illumination could have been obtained more economically by discarding the water-cooled jaws and reducing amperage by 5 to 20%.

Screen light invariably increases and becomes more steady whenever the current is reduced from an overload value to a value which does not exceed the current rating of the trim. The maximum current ratings have been carefully determined by the manufacturer. Each rating is a trifle below the overload limit.

In another case, the results of light-meter tests were actually due to a large-diameter mirror of unusually high optical speed, not to the carbon cooling employed in the lamp. This mirror increased light-pick-up from the positive crater by about 25%. Water-cooling of the carbons, however, *decreased* the light from 10 to 20% at the currents employed in this lamp. The net gain in light-output, therefore, is from 5 to 15% over similar trims burned in an uncooled lamphouse using a smaller mirror. By eliminating the water-cooled carbon jaws, the lamp in question registers light-gains up to 25%, these gains being due entirely to the larger, faster mirror.

[TO BE CONTINUED]

TECHNOLOGICAL STANDARDS

(Continued from page 13)

not be used to change the height of the picture.

Variable Aspect Ratio?

W. G. Altria said there had been a great deal of discussion on the need for a standard ratio, but some producers thought that the aspect ratio should be variable and that masking should be adjustable. One Continental system embodied this principle, and Herbert Wilcox had announced that he would use it for a picture. The aspect ratio varied according to the subject and the individual sequences of the film, and the masking was changed as required *during the performance.*

Dr. Knopp said he had seen photographs and drawings of this system. From the theoretical point of view it had much in its favor, but from the practical point of view he anticipated many trials and tribulations. However,

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he would not like to condemn the system merely on descriptions.

Mr. Fielding said he had seen a demonstration of the system. In his opinion, the varying ratio did not achieve the necessary quality of intimacy in close-ups. When the picture size changed for a close-up, the screen appeared to recede. Conversely, in a spectacular scene the screen appeared to get nearer.

Dr. Knopp pointed out that while 94% of all theatres could accommodate a 1.66/1 screen, and 87% could accommodate a 1.75/1 screen, only 13.5% could accommodate the 2.66/1 ratio without reducing the height. He suggested that the two standards of 1.85/1 and 2.55/1 be temporarily adopted, although he thought that ultimately there must be only one standard.

Screen Size Limitation

Some years ago, Dr. Knopp recalled, Mr. Pulman, in a paper presented in association with Mr. Stableford and Mr. H. P. Woods, had precisely determined the optimum size of picture in relation to the auditorium (the figure then given for picture width was just under one-fifth the distance to the back seats). Did these considerations still hold good? Should the new techniques necessitate structural alterations?

Mr. Fielding stressed that screen size could not be determined from any formula, but each theatre must be treated on its merits. Aesthetics was more important today than in the days of the 4 x 3 ratio. In many theatres a psychological effect made the screen appear larger or smaller than it actually was.

Mr. Swingler pointed out that any particular screen size was correct for only half-a-dozen seats in the auditorium. Sight lines were an important consideration. In the past, theatres were designed with a sloping floor, on the fundamental principle that a person could see the whole of the picture between the heads of the two people in front. If the width of the picture were doubled, then planning must take this into account. It was certain, he added, that the public would not for long put up with a large picture showing a loss of definition and brightness.

Screen Image "Jump"

Mr. Walters said that the movement of characters on the large screen was so great that the eye detected a certain jerkiness from frame to frame. It might, be suggested, be necessary to increase picture speed from 24 to 36 or 48 frames per second.

He objected to the proposal that the exhibitor should install the highest possible screen and then determine the width; the difficulty was that in the majority of theatres the width of the proscenium was the determining factor.

British and American standards were, said Dr. Knopp, in substantial agreement as to the brightness of the picture: the British standard called for a centre brightness between 8 and 16 foot-lamberts, and the American standard from 9 to 14. Earl Sponable (20th Century-Fox) had expressed the view that the ideal centre illumination for CinemaScope was 15 foot-lamberts, but he may have had in mind that with such an initial luminance, after depreciation of screen and optics, the average might be down to 12 foot-lamberts, which tied up with the figure suggested by Paramount for VistaVision.

Replying to comments from Mr. Fielding and others, Dr. Knopp pointed out that flicker increased with picture brightness, and was particularly noticeable at the sides of the screen, where it was seen by peripheral vision.

Import of Screen Type

Had the specular type of screen come to stay? asked Mr. Fielding. That would depend to some extent upon whether 3-D was dead, or whether it would again crop up in improved form; it would depend also upon the demands for correct color rendering toward the side seats. The foot-lamberts from a metallized screen were very different in the side seats as compared with a matte white screen. Mr. Fielding suggested that the patron could not stand as many lumens from a specular screen as from a matte white.

Mr. Stableford considered that the metallized screen would eventually be the only type used. The color and intensity of light were more consistent because of the marked decrease and increase in efficiency of a matte screen before and after re-surfacing. He thought there would be a reawakening of interest in the 3-D film.

An important factor to which attention was drawn was the problem of print density. With different sizes and types of screens it was almost impossible to get one type of print that would satisfy everybody.

Is Stereo Sound Necessary?

Peter Rigby expressed the opinion that to ensure audience participation stereophonic sound was a necessity. Cinerama, which provided the fullest audience participation, relied largely upon stereo sound. It was today necessary to have four-track sound, or at least a form of reproduction where the audience heard sound not only from the various positions on the screen but from around the auditorium.

Dr. Knopp thought the size of screen had an important bearing on this point. If one had a 10-foot screen with stereo sound, there would still be no sense of audience participation. Mr. Rigby agreed that there was a minimum size of screen below which stereo sound was not necessary. He complained that stereophonic sound was generally played far too loud.

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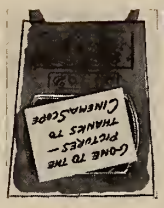
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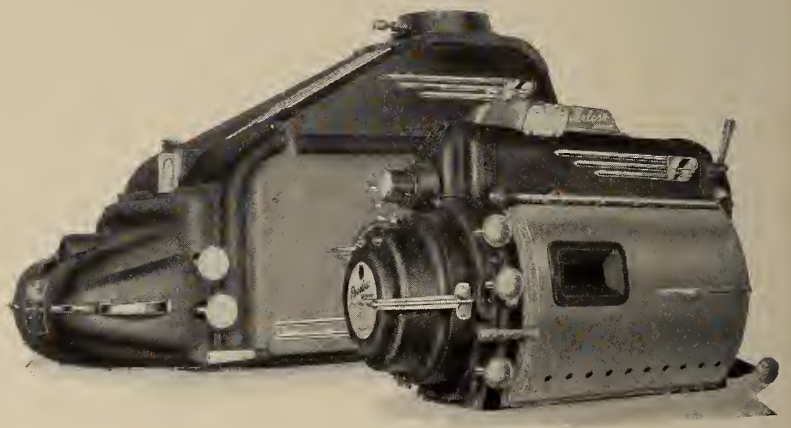
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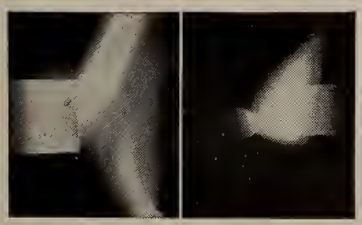
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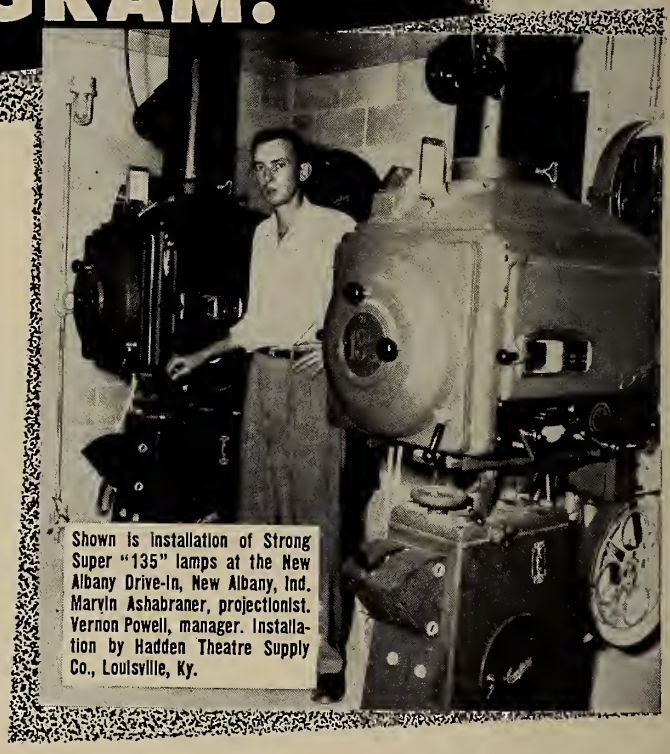
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9E

Monthly Chat

THE EXHIBITION end of this business of ours is daily drawing nearer the jumping-off point as far as the exhibiting pictures is concerned. No more do the producers and distributors of films, grown hog-fat on lush profits gleaned from ruthless rental policies, have the slightest concern for the exhibition branch other than to express deep concern for exhibitor welfare; the while they make moves which can only result in the economic collapse of the *average* theatre owner.

So-called "spectaculars" the roadshowing of which for an extended period of time in a given area at prices approaching those obtained for big-time legit musical productions, thus denuding the area of any worthwhile playing time and box-office dollars, is the definite industry trend today. Additionally, every major producing company, and numerous of the lesser fry, are feverishly at work in readying for Tv-film production. Also, the flood gates of "library" features (already shown in theatres) will soon be opened to pour through Tv outlets an inexhaustible supply of product which is almost certain to obliterate the last vestige of theatre attendance.

Drive-in theatres may hold the line for a more extended period of time, but their present status as exhibitors of motion pictures will speedily be altered to that of playground areas. And no extended mouthings anent the "gregariousness" of humans will change by one iota IP's opinion in this respect.

Roadshows the Order of the Future

Now, producers have a perfect right — in fact, it is their duty to their stockholders — to preserve and even improve their economic well-being. But since the demise of the theatre affects the economic well-being of those who derive their livelihoods therefrom, it is no less the duty of IP to sound the alarm in behalf of its own people.

Todd-AO, Cinerama, CinemaScope wide gauge, Vista-Vision wide gauge, Disney spectaculars, and such ilk, are all roadshows which leave sliver-thin pickings for the average theatre, even if the latter could afford the mass of new equipment already looming on the horizon.

Within the past few weeks IP has had reports from numerous equipment supply people which state bluntly that it is almost impossible to sell new and badly needed replacements to the bewildered exhibitors who are already impoverished by the "paper" they still are paying off on prior equipment purchases. The dazed exhibitor can only mumble that he might be interested but is afraid of what he will be forced to buy next week or next month.

Not once since this economic madness set in has there been an all-industry conference to plot a course which might insure some degree of sanity in procedure. Nor will there be. Instead there will continue the flow of platitudes about industry cooperation "for the common good." We in the exhibition field should assay these mouthings for what they are worth — which is nothing.

Some degree of cooperation, however slight, might be expressed by the producer-distributers in an agreement which will permit the showing of their feature films *only* after 10- or 10:30 p.m. on Tv. This we have to see.

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VOLUME XXX MARCH 1955 NUMBER 3

"Cronar" film base, for which the splicing equipment herein described was developed, has been produced in experimental quantities since 1952 by DuPont. A plastic closely related chemically to other DuPont products such as Nylon and Dacron, it will be commercially available September next. Cronar, an extremely tough substance, although thinner than acetate film base, is reported to have been run 3,900 times through a projector without damage to perforations. A 2,000-foot reel will accommodate 2,700 feet of Cronar film, according to DuPont. The Mylar tape used for splicing is a similar plastic substance (described briefly on page 31 of IP for November, 1954). A single reel of Cronar has been spliced into a half-dozen prints of "Country Girl," current Paramount release, and field teams from DuPont will be on hand for instruction and checking.

A Novel Film-Splicing Method

IN anticipation of the introduction later this year on a commercial basis of its new nylon-like Cronar film base which is not susceptible to ordinary splicing methods, Du Pont has developed a new method for splicing film. Detailed specifications for the ingenious splicer unit used in this process are available to equipment manufacturers without cost.

This new technique provides a ruggedly strong splice between the Cronar base and itself and between all other existing film bases. The latter may also be joined each to the other. The vital consideration is that Cronar may not be spliced by the use of any liquid solvent (conventional film cement) because it is not soluble thereto.

Pressure-Sensitive Tape Splices

The splices are similar to those used for splicing magnetic oxide sound recording film. The perforated tape is made from 1 mil thick "Mylar"* polyester film coated with a transparent adhesive about 0.5 mil thick, making the total tape thickness nominally 1.5 mils. Splices are made by applying pieces of this tape two frames long to *both* sides of the film, as shown schematically in Fig. 1.

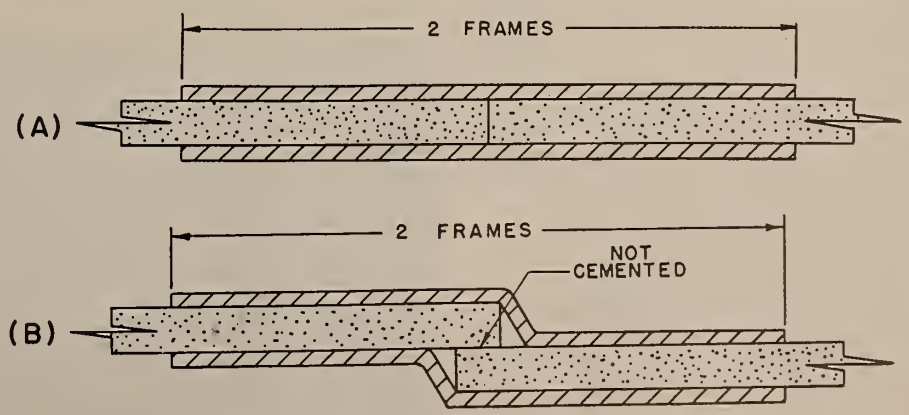
Figure 1-A shows a butt splice, the total thickness of which is 9 mils for a 6-mil film. Fig. 1-B shows a lap splice, the total thickness of which is 15 mils. This latter splice may be made either to full-hole or to half-hole dimensions without significantly affecting the strength of the splice. Neither the butt nor the lap splice requires scraping or cementing.

Requisite Application Conditions

When applying the tape to the film, two conditions must be met if the splice is not to be apparent on the screen. First, the edges of the tape must be outside the frame; second, the tape must be applied smoothly, without wrinkles or trapped air bubbles. The splicing device shown in Fig. 2 is an experimental model which meets the requirements reasonably well, but undoubtedly better and simpler splicers can be made.

As can be seen from Fig. 3, the perforated tape is fed from the supply spool onto the sprocket wheel of the tape dispenser, with the non-adhesive side of the tape against the sprocket. This wheel is slotted in four places around its circumference so that the

FIG. 1. The two types of splices that can be made with the DuPONT device. The butt splice shown at (A) is made when twa strips of thin Mylar adhesive tape are pressed against the film. Belaw at (B) a lap splice is shown. Splice thicknesses: butt — 8 mils; overlap — 15 mils.



* Registered trademark of E. I. du Pont de Nemours & Co.

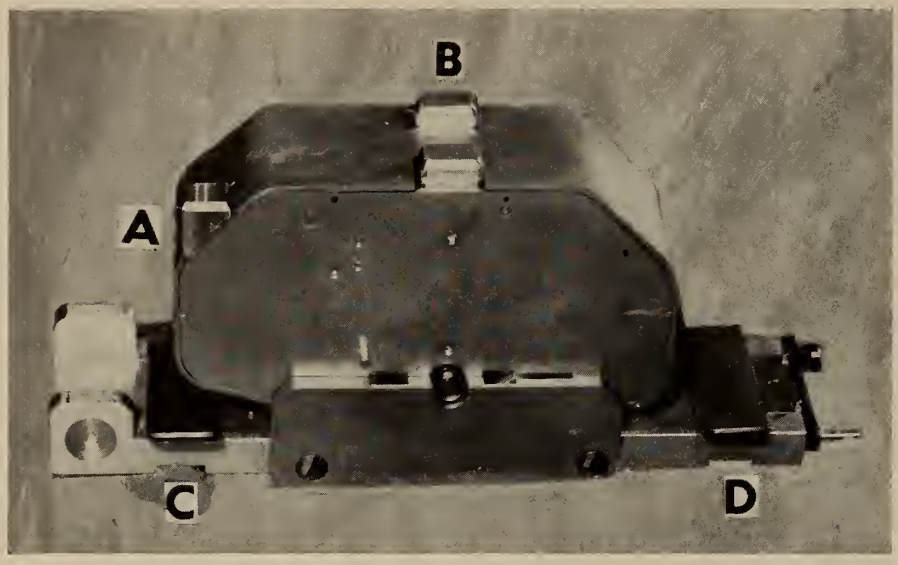


FIG. 2. Broadside view of the DuPONT splicer. (This is a laboratory not a production model, although the latter type is now in work by several prominent manufacturers.) At "A" is a plunger which actuates a knife blade for cutting the adhesive strips into lengths of the proper size. "B" indicates two plungers which lock the mechanism top to its base after the film has been positioned properly on the latter. "C" and "D" indicate clamps for holding the film in precise registration.

knife-blade can cut a two-frame length of tape to be dispensed.

The Splicing Procedure

To make a splice with this device, the two lengths of film to be joined are positioned onto the registering pins of the base unit, shown in Fig. 4. Actuating the plunger at the forward end of the dispenser unit causes the knife-blade to cut a two-frame length of tape on the sprocket wheel. Now the dispenser unit is positioned into channels in the base unit and moved from right to left. This rolls the precut length of tape off the sprocket wheel and applies it, in register, to the films to be spliced.

The film is then turned over and the operation repeated to complete the splice. The dispenser cannot be positioned into the channels of the base unit unless the knife-blade plunger has been actuated to cut off a two-frame length of tape.

Rolling the tape off a sprocket wheel is one way to apply it smoothly, in register with the film, and without occluding air bubbles. There are other ways to apply perforated adhesive tape to film, some of which may be more attractive than the method shown here.

Good Light Transmission

Mylar tape and its adhesive layer are essentially transparent and colorless, and when applied to both sides of a motion picture film reduce the optical transmission of the two frames involved by only about 7%, an amount which allows the splice to go completely unnoticed on the screen.

Stress-strain measurements on both butt and lap splices show that, for load values far in excess of those which perforations can withstand, the elongation or stretching of any of the tape splices is indistinguishable from that of the unspliced film. A tensile pull of more than 50 lbs. is required before the tape splices begin to yield. This load is more than five times that at which the perforations would be torn from the film.

A dynamic stress-strain test of both lap and butt tape splices was also carried out. In this test a five-pound stress was applied and relieved 120 times, and a twenty-pound stress was applied and relieved 40 times, each over a ten-minute period at room temperature. 74 degrees F. Yet, as a result of this test, the tape splices showed no measurable deviation from the behavior of unspliced cellulose triacetate film.

It is well known that even a five-pound load, applied at these low frequencies of application to triacetate film running over a sprocket, is more than enough to completely strip the perforations.

Tests at High Humidity

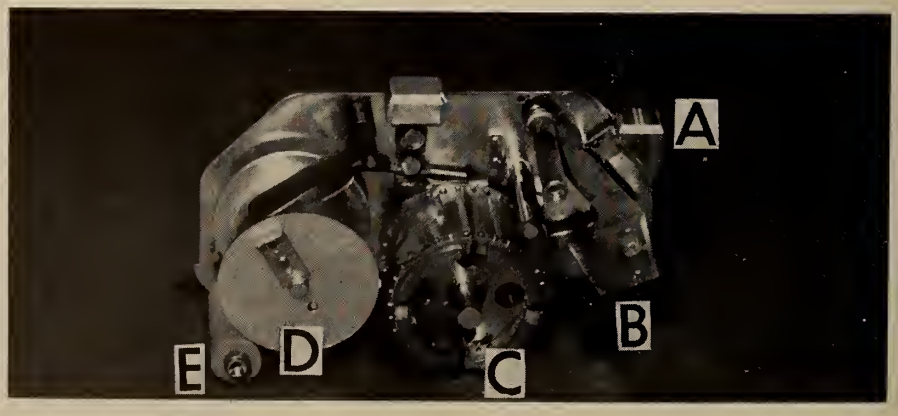
Tests of tensile strengths of tape splices made at a range of relative humidities confirm the general impression that there should be little change with humidity. At high humidities, 95% to 100%, there is some reduction in ultimate strength, though the splices showed satisfactory behavior for stresses much in excess of the strength of perforations as they run on sprockets.

It is interesting to note that unspliced cellulose triacetate film also shows reduced strength at high relative humidity. At low humidity, where conventional solvent cement splices tend to become weak, no similar tendency is shown by the tape splices.

Tensile Strength High

An effect of temperature on splice tensile strength was investigated, and no significant difference was found in the stress range of normal operations. Even at temperatures as high as 140 degrees F. the tape splices were stronger than the perforations. And at temperatures as low as26 degrees F. the tape splices showed

FIG. 3 (top). Stripped-down view of splicer tape-dispensing unit (refer to Fig. 2). "A" is the plunger which is connected to the knife "B". At "C" is the sprocket which engages the film and from which the adhesive tape is literally rolled onto the film. The supply reel for the tape is shown at "D". At "E" is shown a rubber roller which prevents metal parts from contacting the film while a splice is being made and while the sprocket "C" is rolling the tape along the splice area.



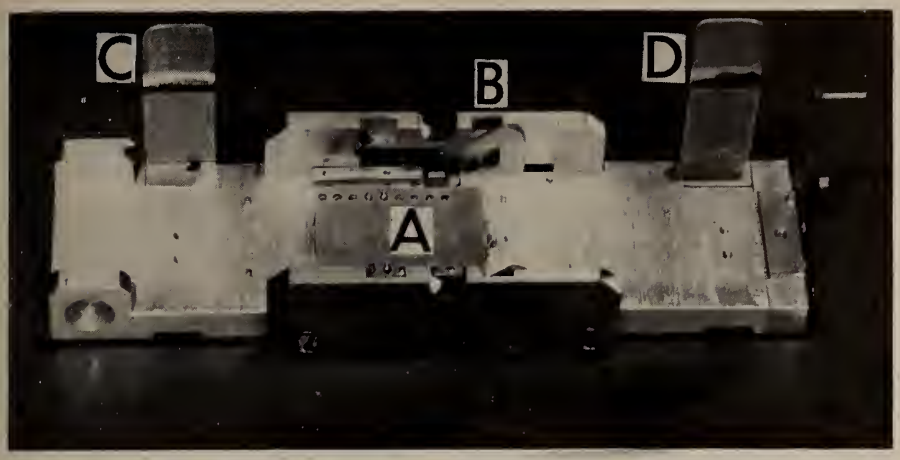


FIG. 4 (bottom). The mechanism where the two ends of film to be spliced are registered and clamped into place. At "A" is shown the rubber base pad on which the film is registered by pins. The catch at "B" is duplicated on the other side of the base and they lock the upper part of the mechanism in place. "C" and "D" are the locking clamps.

good strength, with no tendency to become brittle and crack.

The investigation of high temperature phenomena was extended to cover an additional factor, creep of the adhesive bond. Even casual examination shows that the rate and duration of load application affects the result, and under sustained load "creep" of the adhesive tape in relation to the film did take place. But it required several hours at a temperature as high as 120 degrees F. for a sustained load of 5.2 lbs. (a load that will strip the perforations from the film in a matter of seconds) to pull the tape splices apart.

Tests Under Heat

Motion picture projection equipment in normal use never applies the long continued stress, and hence uses this type of splice under most advantageous conditions. No tendency for the adhesive to bleed was noticed, even at temperatures above 100 degrees F. No measurable slippage of tape splices could be induced by continuous high-intensity arc projection of film loops, by aging tightly wound rolls, or by repeated rewinding of rolls under tension at 150 degrees F. During high-intensity projection of loops of black and white film, blistering of the emulsion took place before the tape splices were affected by the heat.

Creep and the dynamic characteristics of the splices were found essentially unaffected by changes of relative humidity from 5 to 100%.

Because of the high tear strength of the "Mylar" polyester film from which the tape is made, the tear strength of the tape splices is considerably greater than that of triacetate film.

Both lap and butt splices have been cleaned with commonly used film cleaning solutions such as Oronite (Oronite Chemical Company) and Freon 113*; also, trichloroetheleyne alcohol and ammonia, carbon tetrachloride and gasoline without loosening the tape. Yet these tape splices can be taken apart and the films respliced without any loss of frames.

Impressive Projection Life Tests

Both lap and butt splices have shown good screen steadiness and have run smoothly through a projector in laboratory tests. Most samples tested have been projected in loops more than 1000 times without splice failure. Some of the butt splices tended to become noisy after 50 to 100 projections, due to the flexing of the butt joint. This causes the film loop to slap just before it enters the projector gate. Lap splices, having greater stiffness, do not show this effect.

As must be expected even with splices such as these there are factors which make some last longer than others. Yet the minimum number of projections for any tape splice we have made was 345 runs. The great majority of tape splices have outlasted the film when attempts have been made to run them to destruction.

Tape splices are also useful for other types of film repairing. For example, a broken perforation need no longer be cut out because a piece of splicing tape will make it stronger than before. The utility of tape splicing in the 16-mm field, while not discussed herein, may be even greater than for 35-mm applications.

Some projectionists stick a piece of ordinary transparent adhesive tape over every cement splice in a reel before projecting it so as to obviate any possibility of a film break.

* Registered trademark of E. I. du Pont de Nemours & Co.

Operating Theatres Up By 1637 in Past Year

Reliable figures indicate that the gains made by the motion picture exhibition industry last year were no flash in the pan. Between March 1, 1954, and January 31 of this year, the number of operating theatres in the United States increased by 1,637 to a total of 19,101.

At the end of 1954, there were 15,039 active four-wall theatres and 4,062 drive-ins. Between the end of 1953 and the end of 1954, there was a net increase of 1,136 theatres of which 271 were drive-ins and 865 were four-wall theatres. In March, 1954, there were 13,553 four-wall theatres and 3,911 drive-ins.

Drive-Ins Swell Total

On March 1, 1954, when Congress was still considering the admission tax, there were 6,280 closed theatres in the U. S. At the end of 1954, the number of closed theaters had dropped to 5,651, a shift of 665. Eleven states, including New York, had more closed theatres at the end of 1954 than at the end of 1953, but the net changes in all such cases were small.

A tabulation giving the number of active theatres for each year since 1950, shows that the total at the end of 1954 was within five theatres of the high point of 19,106 reached at the end of 1950:

END OF YEAR	ACTIVE 4-WALL THEATRES	ACTIVE DRIVE-IN THEATRES	ACTIVE TOTAL THEATRES
1950	16,904	2,202	19,106
1951	16,150	2,830	18,980
1952	15,347	3,276	18,623
1953	14,174	3,791	17,965
1954	15,039	4,062	19,101

New SMPTE 16-mm Test Film

A short test film for rapid checking and demonstrating of 16-mm projector system performance has been developed by the SMPTE and U. S. Navy.

This high-quality test film, running 150 feet in four minutes, permits checking for faithful reproduction of wide-range music, picture steadiness, uniform picture brightness, flutter, correct sound-track-guide adjustment, normal volume, sound focusing in both standard and non-standard emulsion positions, frequency response from 50 to 5,000 cycles, and dialogue intelligibility. Obtainable from the SMPTE, 55 West 42nd St., New York 36, N. Y. ($10.50).

British Projectionist Opinion on the Line

THIS second open forum emphasized the fact that the projectionist was the key man of the industry: "If he does not do his job properly, people like myself don't get a proper show, all the thousands of pounds spent in production are wasetd, and we all swap the refrigerator for a television set."

A recent survey among people in all walks of life revealed that the wide screen was universally popular—the "postage-stamp" screen is "out."

First question: "What causes a white flash on a change of scene?" A. E. Ellis (print manager, AB-Pathe) said that it was due to bad splicing. G. Pinchen said he had noticed the fault in one particular feature film: it was obviously in the editing of the negative and showed up in CinemaScope because the frame was much taller than the normal frame.

What Constitutes a Good Print?

B. Heywood reported a standard print showing the same fault. R. Pulman said this feature had been filmed in both CinemaScope and standard, and that the white line did not come from the "squeezing" of the print. G. Butler suggested that if the CinemaScope projector mask were slightly reduced in height, it would not occur. N. Mole, projection engineer, thought the trouble was caused by the negative inter-perforation joins. Pinchen suggested dropping the screen masking slightly.

J. W. Short (Odeon) complained that on change of scene there was often a change in brightness. E. Dent suggested that density was not the same in Print 1 as in Print 60 of a batch, and that grain was more noticeable in the last copy.

C. J. Phillips (A-B Pathe lab manager) asserted that these faults were impossible; very careful watch was kept on density; also, that with modern fine-grain positive emulsions, grain was a function of the negative. Every reel of every feature was inspected by experienced viewers.

Causes of Image Flicker

Replying to a complaint anent flicker in prints, C. J. Phillips suggested that there could be only two reasons for its occurring in the print: printer belt slippage and variation in printing light intensity. Every precaution is taken against both faults.

Ellis recalled a complaint regarding flicker. Investigation showed it to be in the original fine-grain print from America. He spoke of the high standard of duping today: it is sometimes impossible to distinguish a duped print from an original. Grain is, however, more noticeable with the present large screens. It is rarely noticeable in CinemaScope because the producers had been careful not to make anything in black-and-white in which grain would be more noticeable than in color.

J. Faulkner had recently run a print in Eastman Color. The density was ideal from beginning to end: there was no variation, sound was excellent and was so level that the fader was not touched. On the other hand, a print of a British feature run recently varied in density, and sound had to be varied from 12 to 16.

J. W. Short suggested that prints were graded in quality—the "A" prints to "A" theatres, the "C" prints to "C" theatres. This, Ellis strongly rejected. Every print, he said, was identical. E. Underwood, nevertheless, asserted that once in running a Royal premiere, a special print had been supplied.

Tips on CinemaScope Projection

G. Butler spoke of his experience in running CinemaScope. The problem of magnetic pickup is not as severe as had been expected. Due to sight lines it had been expected that a number of seats would be closed; in practice, the picture is quite satisfactory from every seat. The lining-up of the anamorphics is not too critical. Due to a new directional screen, the picture had been improved from the side seats.

Phillips, however, spoke of the inadequacy of some existing equipment for the new conditions. He had difficulty in maintaining even screen illumination when the arc current was increased from 55 to 70 amps, which was the top rating of his rectifier. J. Faulkner referred to a change in focus at the start of the reel, due no doubt to expansion of the optical fittings; he had decided that once the lens was focused it was best left alone.

J. W. Short said that in many theatres the projectionist had to put

Water the Leaves — Neglect the Roots

One magnificent attribute of the British is their unparalleled ability in times of stress to "rise to the occasion." Toughened and strengthened by years of austerity, the British motion picture technologists were totally unwilling to accept *per se* that which was blithely handed to them by producers and distributors. Instead, they immediately summoned into conclave representatives of the producer, laboratory, distribution and exhibition branches of the industry (the latter category having an overwhelming representation of working projectionists) to swap praise and pity, confidence and condemnation.

This admirable procedure is totally incomprehensible to American technological circles, where every move must be rubber-stamped by what amounts to a self-appointed heirachy which down through the years has been more interested in protocol than practice.

Following a recent meeting of the British Kinematograph Society called to discuss *practical* problems of exhibition—the sum total of *all* industry efforts—there appeared in the British technical press lamentations anent the non-vocal projectionist craft. No sooner did this commentary appear that another meeting was called which developed in detail those purely exhibition problems the solution of which might well chart the course of the industry's future well-being.

Culled from the pages of our esteemed contemporary, *The Ideal Kinema* (London), IP is privileged to present a summary of this session, which is at once a tribute to British determinedness and American laxity.—EDITOR.



Making the brave bulls beautiful

In black and white, scenes like this are no trick for skilled technicians. Basically, they're easy to take, easy to process.

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his nose to the porthole in order to see the whole of the CinemaScope picture; and Butler added that it was often impossible to see the whole of the screen while adjusting the arc. Mole urged that arc control should be accessible from the side of the machine.

Firm Support For Screens

E. Trimmer found that when changing back from CinemaScope to wide-screen, the top right-hand corners of the picture went out of focus. Mole suggested that this was due to the design of American projectors: tightening the gate tension might cause bowing of the gate runners, putting the film out of focus on one side. Leslie Knopp was more inclined to suspect the lens; although Trimmer stated that turning the lens did not correct the situation.

J. Faulkner pointed out that with the former sizes of screens the weight of the screen was usually vertical and the screen did not sag. If a wide screen were installed at an angle, the centre of the screen tended to sag. If speakers were immediately behind the screen, there was a danger of the screen lying on the speakers and possibly wearing through. J. W. Short thought the fixing adequate.

Cleaning Screens a Problem

T. S. Harkness opined that screen sag was chiefly due to the use of plastic materials and bracing cords which change with ambient temperature. T. Berry had found strain marks appearing on the screen. This, said Harkness, is caused by atmospheric conditions and could be cured by first loosening the ties at the bottom and tightening at the sides and top, and finally tightening the bottom. Parsons wondered whether this was the responsibility of the projectionist.

Butler pointed out that when a screen is installed at an angle dust tends to collect on it. He had to brush his screen twice weekly to keep it clean. Harkness suggested that a shield should be built above the screen to protect it from dust and water, but this is often difficult.

G. E. Fielding (chief engineer, ABC) thought that the settling of dust was largely due to static attraction. He emphasized the need for extreme care in brushing the screen. In the case of a specular screen, if the particles were burnished, the characteristics were altered. Suction cleaning is useless unless it is combined with a brush, and a brush is liable to alter the surface.

Mole confirmed this point: actually, it might be better to leave the dust on the screen. Little light was lost as compared with the effect of a matte screen, although it might alter characteristics.

Eliminating Surface Static

Dr. Knopp explained that pure aluminum has an inherently negative potential, while the constituents of atmospheric dust are partly neutral and partly positive, and therefore the screen attracts the dust. In another field, a solution had been found by giving the aluminum a fairly strong positive charge: by passing a negative pole over the surface of the aluminum, about ½ inch or ¾ inches away from it, the dust is removed. It would be worth a trial to charge positively the surface of a metallic screen.

Metallic Surface Spraying

S. A. Stevens (Westinghouse) explained that in spraying with metallic paint it is possible to use such a high proportion of metallic-powder-to-lacquer that the surface may be made electrically conducting; but with a smaller proportion of metal, each individual flake is insulated and the surface can build up an electrostatic charge. If the surface were such that an electrostatic charge could not be held, and then a metallic thread were run around the screen and bonded to earth, these electrostatic problems could not arise.

F. C. Cable (ABC) thought that the paint became electrostatically-charged as it passed through the spray-gun during application.

Ce Bon — No?

Typically Gallic in conception and design is the following description of a recent patent by P. Angenieux, French lensmaker:

"A housing fixed over the projection port contains a sheet of glass at an angle of 45 degrees to the projection beam, which reflects a small proportion of the light from the lens through a magnifying system, and off another 45-degree mirror onto a small viewing screen at the side of the projector. The projectionist can thus see a small image of what is actually on the screen.

Presumably it is intended that the plane glass set at an angle of 45 degrees should replace the ordinary glass window. If a shutter were provided beyond the glass, the device would also lend itself to checking racking(framing in Americanese) in threading."

RCA's "Music Synthesizer"

RCA Laboratories have created an electronic system capable of generating any tone produced by the human voice or any musical instrument, as well as any musical tone which is beyond the capabilities of a voice or conventional musical instrument. It is a means for producing electronically an infinity of new musical complexes employing the sound of human voices and conventional instruments, or tones that may never before have been heard, either in solo performance or blended in any desired orchestral arrangement.

This electronic instrument also offers new opportunities for the production of phonograph records, since it can produce any kind of sound that can be imagined. Further, old recordings can be rejuvenated into new phonograph records free from distortion and noise.

It is not necessary that a composer be able to play a musical instrument, for whatever musical effects he wants to create he can achieve by use of the synthesizer.



"Ideal Kinema," London, England

"It's been like this since they installed stereophonic sound in the theatre where he works."

C'Scope for M-G-M Cartoons

M-G-M has decided to film all its cartoons in CinemaScope. This is in keeping with developments at most other studios which have been generally stepping up the number of short subjects in CinemaScope. M-G-M previously announced that all its foreign feature film releases would be in C'Scope.

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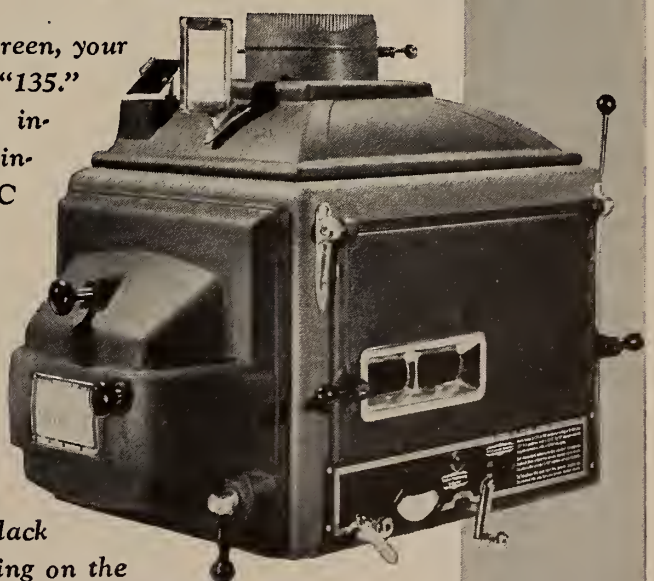


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No matter which aperture, or the size of your screen, your picture will really sparkle when you have the Excelite "135."

National's Reflect-O-Heat unit permits a great increase in volume of light, without a corresponding increase in heat at the aperture. The AUTOMATIC Crater Positioning Control System insures that both carbons are so fed as to maintain the correct arc gap length and position of the positive crater at the exact focal point of the reflector. Thus, the screen light is ALWAYS of the same color, without variations from white to either blue or brown.

The arc is stabilized by a stream of air which prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.



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In this the third of a series of four articles anent light sources for motion picture projection is a comparison between low- and high-intensity carbon arcs optical systems, proper arc and lamphouse alignment, and a group of tables which graphically point up the data presented.

By ROBERT A. MITCHELL

Light Sources For Film Projection

IT is unfortunate that water-cooled carbon jaws and lamp equipments are often placed in bad odor by unrestrained claims. It is unfortunate because these equipments are really good, and because the water-cooling of carbons is definitely a forward step in projection technology.

To repeat, the writer objects not to water-cooled lamp equipments but to the dubious data derived from unscientific and "loaded" tests. He is interested in projection *quality;* and we know well that a slightly lowered efficiency is a small price to pay for the more uniform light that carbon cooling makes possible.

The greatest importance of water-cooling lies in the near future, however. By using special heat-conducting positives in water-cooled jaws, the overload limit is raised to values so high that the crater candlepower of the H.I. arc can be increased to *twice* the crater candlepower of an uncooled high-brightness arc operated at maximum current. But *special* carbons, known generally as "high-brightness" positives, *must* be used. The Ultrex carbon manufactured by the National Carbon Co. is such a positive; and this should not be confused with the regular "super-high" positive known as Hitex.

Special Carbons Required

It is only by burning special high-brightness positives that substantial increases in crater candlepower can be obtained with effective carbon-cooling devices.

High-brightness positives (such as Ultrex) will undoubtedly play an important role in process projection and, very likely, in those large theatres and drive-ins where high operating costs can be met and the film adequately protected by heat-filters and other film-cooling devices from the destructive effects of excessive heat. The expensiveness of high-brightness projection is due to such factors as high initial equipment costs, parts replacements, low luminous efficiency, high current consumption, and rapid burning rate of carbons.

The secret of the high-brightness type of carbon is a relatively thick shell of hard carbon surrounding the core of soft carbon mixed with a large proportion of rare-earth and thorium compounds which function as flame materials, as in the regular H.I. positive carbon. The regular carbon, however, has a comparatively thin shell which will not stand much overloading, water-cooled or not.

Carbon Properties Controlling

Water-cooling, if effective, raises the overload limit of the standard H.I. carbon by no more than 5%. The core, being soft, does not conduct heat rapidly enough, and the shell is too thin to do so. The water-cooled jaw is handicapped in its job of removing heat by the carbon properties.

By increasing the thickness of the shell, however, a greater amount of heat is allowed to pass from the tip of the carbon to the jaw, which drains off the heat *via* cold water.

With a more efficient removal of heat, the positive crater does not burn so deeply. This characteristic of the high-brightness positive permits higher amperages to be applied to the arc. And the more powerful the current, the more intense becomes the bombardment of the vaporized flame materials by electrons. The flame materials are thus excited to higher brilliancy, and a crater candlepower about twice that of a comparable uncooled arc burned at maximum current-rating is obtained.

"Horizontal" Candlepower

Accompanying this article are five simple tables which are well worth a few moments' study. These tables,

TABLE A
CRATER CANDLEPOWER OF L-I, OLD-STYLE " VERTICAL" ARCS BURNED WITHOUT WATER-COOLING

TRIM Pos.	Neg.	ARC AMPS.	ARC VOLTS	C/P OF POS. CRATER
5/8"	5/16"	25	55	6,500
5/8"	5/16	35	55	9,500
5/8"	5/16	50	55	17,000
3/4"	11/32	50	55	14,000
3/4"	11/32	65	60	22,000
7/8"	11/32	65	60	19,000
7/8"	11/32	85	60	29,000
1"	7/16	85	65	25,000
1"	7/16	105	65	37,000
1"	7/16	120	65	52,000
1 1/8"	1/2	120	65	46,000
1 1/8"	1/2	140	70	61,000

TABLE B
CRATER CANDLEPOWER OF L-I REFLECTOR-TYPE ARCS BURNED WITHOUT WATER-COOLING

TRIM Pos.	Neg.	ARC AMPS.	ARC VOLTS	C/P OF POS. CRATER
9 mm	6 mm	10	55	3,500
9 mm	6	15	55	4,500
10 mm	7	15	55	4,200
10 mm	7	20	55	5,800
12 mm	8	20	55	5,000
12 mm	8	25	55	6,700
12 mm	8	30	55	8,800
13 mm	9	30	55	7,700
13 mm	9	35	55	10,000
13 mm	9	40	55	14,000
14 mm	10	40	55	13,000
14 mm	10	45	55	17,000
14 mm	10	50	55	20,000

compiled from both American and European data, give the hemispherical (also called the "horizontal") candlepower emitted by the craters of various types and sizes of positive carbons burned at various currents.

A 9 mm—8 mm "simplified" H-I trim burned at 75 amperes without water-cooling, for example, is shown by Table C to have a horizontal crater-candlepower of 24,000. This means that the crater has the brightness of 24,000 standard candles concentrated in the tiny cup-like depression at the tip of the positive carbon.

Old vs. New L-I Arcs

Horizontal (hemispherical) candlepower is an especially reliable indication of actual crater brilliance because it is independent of the manifold variables which influence the number of lumens (volume of light) issuing from the projection lens. The candlepowers given in these tables are only approximate, but nevertheless represent with fair accuracy the intrinsic brightness of the craters of carbon arcs adjusted for normal burning.

Table A reveals the crater candlepower of the old-style L-I "vertical" arcs, the earliest type used in theatrical motion picture projection. A comparison of these candle powers with those in Table B, which lists the candlepowers of improved L-I reflector arcs, reveals that the old-type arcs were capable of much higher brightness than the most powerful L-I mirror arcs. The reason, of course, is that higher currents were often employed in the now obsolete L-I vertical arcs. The old-style lamphouses having small condensing lenses were very inefficient, however, and screen light was often very poor.

The highest-powered L-I vertical arcs nevertheless compare favorably in the matter of crater candlepower with modern H-I rotating-positive arcs, both mirror and condenser types (Table D), and they exceeded by more than two times the intrinsic crater-brightness of even the most powerful "simplified" H-I arc (Table C).

Cooling Effect on Candlepower

Since carbon-cooling was not used for L-I arcs, the crater-candlepowers in Tables A and B are for uncooled arcs only.

In Tables C and D candlepowers for both "uncooled" (actually air-cooled) and water-cooled arcs are given. The carbon jaws for water-cooled arcs are silver for the positive carbon and copper for the negative carbon. The use of silver for the positive jaw is necessitated by electrolytic action which would roughen the carbon-contacting surfaces of the jaw were it made of copper. This action does not occur in the negative jaw.

The protrusion of the positive carbon beyond the edge of the water-cooled jaw is an important factor. For the most effective cooling, the length of protrusion should be as short as is practical, namely, 3/8 inch for the smaller positives and about 1/2 inch for the larger sizes. Cooling of the negative is much less critical, it being necessary only to prevent spindling.

Tables C and D show that water-cooling results in a loss of brightness at any given current, the average decrease in brightness being about 15%. Consumption of the positive carbon is also decreased.

Table E is for the high-brightness (known as Ultrex) type of positive carbon. The negatives used in these trims are regular H-I negatives.

The most significant fact revealed by Table E is that water-cooling of the carbons materially reduces the light-output of high-brightness arcs when the current is below the "uncooled" overload limit, but nevertheless makes possible the burning of these carbons at amperages far above this overload limit—currents so great that water-cooling *must* be used. At these tremendous currents the crater brightness increases, with about twice the normal ("uncooled") candlepower as the practical limit.

Positive Carbon Crater

The carbon arc is better suited to the requirements of motion picture projection than most other illuminants because of the small size of the luminous crater of the positive carbon. The high optical efficiency of modern projection lamps is, in fact, made possible by the smallness of the arc crater.

The luminous crater, though very "concentrated," is nevertheless not a "point source." It must be considered optically as a disk of small, but appreciable, area; and it is this bright disk which is imaged on the projector aperture as a circular "spot" just large enough to fill the aperture with

TABLE C. — CRATER C/P OF "SIMPLIFIED" H-I REFLECTOR-TYPE ARCS

COPPER-COATED TRIM Pos.	Neg.	ARC AMPS.	ARC VOLTS	UNCOOLED CRATER C/P	COOLED CRATER C/P
6 mm	5 mm	35	35	12,000	9,100
6 mm	5	40	35	14,000	12,000
6 mm	5	45	35	16,000	14,000
7 mm	6	45	35	15,000	12,000
7 mm	6	50	40	17,000	15,000
7 mm	6	55	40	18,000	17,000
8 mm	7	55	40	16,000	13,000
8 mm	7	60	40	18,000	16,000
8 mm	7	65	40	21,000	20,000
9 mm	8	65	40	20,000	16,000
9 mm	8	70	45	22,000	19,000
9 mm	8	75	45	24,000	21,000
9 mm	8	80	45	26,000	24,000
9 mm	8	85	45	29,000	28,000

illumination of reasonably uniform intensity. If the spot is too small, the corners and sides of the picture will be dark and discolored; if too large, most of the light will be wasted on the cooling plate and never reach the screen.

The distribution of luminance across the face of the crater is a very important consideration. Because the spot is an image of the crater, any inequalities of brightness in the crater will be duplicated in the spot. The low-intensity crater is remarkably uniform in brightness, producing a "flat," clean-cut spot and screen illumination as bright at the edges as in the center.

The high-intensity crater, on the other hand, is brightest in the center with a rapid fall-off in brightness at the edges. As a result, the H-I spot is diffuse, having only a comparatively small central area of fairly uniform brightness. Attempts by projectionists to make screen light more uniform by moving the H-I crater closer to the mirror increases the size of the spot and wastes light.

Screen Light Distribution

The brightness-distribution difficulties of H-I projection have been successfully overcome in a few lamps of special design. Conventional H-I arclamps yield a side-to-center screen light distribution of about 60% when adjusted for maximum light, or 80% when adjusted for the most uniform illumination. Any side-to-center value between 80% and 100% meets the standards of high-quality projection.

The optical design of the standard arclamp is very simple, involving only a means of collecting as much of the crater-emitted light as possible, and another element to converge the collected light into a concentrated spot at the aperture of the projector. The usual type of reflector arc has only one optical element—the mirror—which plays the dual role of collector and converger.

Mirror, Condenser Contrast

A few older types of lamps employed a mirror to collect the light and a large condensing lens to converge the rays to a focus at the aperture. In lamps of this type the mirror has the parabolic curvature of a searchlight mirror to reflect the light in essentially parallel rays.

The standard arclamp mirror is elliptical in form, not parabolic. An elliptical mirror has a greater degree of curvature in its edge-zones than a parabolic mirror, and is, in fact, a section of a geometric solid produced by rotating an ellipse on its major axis.

If the elliptical cross-section of such a mirror be completed, it will be found that the positive crater occupies one focus, and the projector aperture the other focus. The focal point occupied by the crater is commonly called the "geometric focus," and is measured by the distance separating it from the center of the mirror.

The condenser-type lamp has a collecting lens instead of a mirror. Another lens converges the light. These two lenses, collector and converger, are placed close together in the lens mount. Since the positive crater must face the collecting element in any type of lamp, the most obvious structural difference between reflector and condenser lamps is the orientation of the carbons.

"Solid Angle" Light Pickup

Illumination efficiency of an arclamp increases with the size of the "solid angle" of light intercepted by the collecting element, mirror or lens. The earliest vertical-arc condenser lamps picked up a cone of light having an angular diameter of only about 45 degrees. Modern H-I condenser lamps intercept from 60 to 90 degrees, hence are much more efficient. Reflector lamps of all types, both L-I and H-I, are the most efficient of all, picking up from 120 to 150 degrees.

Not all of the light picked up by the collecting element reaches the aperture, of course. There are unavoidable losses due to absorption by the glass, by imperfect reflection in the case of mirrors, and by surface reflections in the case of condensing lenses. These losses seldom amount

TABLE D. — CRATER C/P OF REGULAR (ROTATING-POSITIVE) H-I ARCS, BOTH CONDENSER AND REFLECTOR TYPES

UNCOATED TRIM Pos.	Neg.	ARC AMPS.	ARC VOLTS	UNCOOLED CRATER C/P	COOLED CRATER C/P
Trims with Regular Positives					
9 mm	8 mm	75	50	35,000	31,000
9 mm	8	85	55	40,000	38,000
10 mm	9	100	60	43,000	40,000
11 mm	9	120	65	50,000	46,000
12 mm	10	125	65	52,000	47,000
14 mm*	11	130	70	49,000	43,000
14 mm*	13	150	75	63,000	58,000
14 mm*	13	160	80	67,000	64,000
Trims with "Super High Intensity" Positives					
10 mm	10	125	65	77,000	71,000
10 mm	10	130	70	82,000	79,000
10 mm	10	135	70	86,000	85,000
14 mm*	13	170	75	78,000	75,000
14 mm*	13	180	75	92,000	92,000

*In America the 13.6 mm regular high-intensity and super high-intensity ("Hitex," National Carbon Co.) positives are used instead of the 14 mm size. The difference in current requirements and burning characteristics is negligible. Also, the sizes of the negative carbons in these trims are usually given in fractions of an inch in America.

to more than 20% or less than 10%, however.

The angle of light-pickup may be increased by either increasing the diameter of the collecting element or moving the arc closer to the collecting element. Both expedients are limited in usefulness by practical considerations.

Light Increase Expedients

In the first case, an oversize collector increases the "spread" of the light rays passing through the aperture. As a result, many of the rays which pass through the aperture may miss the lens entirely, passing to one side of the lens barrel. Since it is the rays passing near the edges of the aperture which are apt to miss the projection lens, the effect of an oversize collector is to increase the brightness of only the middle of the projected picture.

Moving the arc closer to the collecting element necessitates a greater curvature of the mirror or condensing lenses to prevent out-of-focus effects which discolor the light, or else an increase in the distance between lamp and aperture with smaller collector corrections. But this expedient increases the size of the spot (image of the arc crater), wasting light on the cooling plate.

There exists a "happy medium" where maximum efficiency is obtained, hence the optical specifications of most projection lamps cannot be altered without seriously impairing performance.

Although simple in theory, the optical functioning of any projection arclamp is considerably complicated by the fact that the "object" (luminous positive crater) and the "image" (the "spot") must be aligned with the aperture and lens of the projector as well as with the optical components of the lamp itself. In other words, the exact centers of (1) mirror (2) positive crater (3) condensing lenses, if any; (4) projector aperture, and (5) projection lens must all lie on the *optical axis* of the projection system.

Optical Element Displacement

The optical axis of a motion picture projector is determined by the positions of aperture and lens of the projector head, *not* by the lamp. The axis is a *straight line* which passes through the exact centers of lens and aperture. Extended forward, the optical axis hits the center of the screen when the projection is level, or a point slightly above the center of the screen when there is a downward projection tilt. Extended backward, it should pass through the exact centers of the condensing lenses (if any), positive crater, and reflector.

It is astonishing how much light is lost when the crater and lamp optical elements are displaced by even a small fraction of an inch from their correct positions on the optical axis. Not even the most meticulous adjustment of the mirror-focusing knobs can restore light which is lost when the mirror, the arc, or the whole lamp is shifted off the axis or positioned askew on the pedestal lamp-table. Restoration of the alignment has often doubled, and in many cases tripled, the light on the screen.

The screens of many theatres are being literally robbed of light by maladjustment and misalignment of the projection lamps. In most instances the projectionists have become so accustomed to the poor light that they accept it as normal. The lamps have "been that way" for more years than anyone can remember; and nobody has bothered to check them and line them up properly.

Lamp Alignment Procedure

Detailed instructions for adjusting the positions of lamp elements may be obtained from the manufacturer. These instructions should be carefully followed whenever it is necessary to realign a carbon guide, raise or lower a positive jaw, or move a mirror bracket sidewise. Aligning tools for certain makes and models of arclamps may be purchased or borrowed from equipment dealers, or the projectionist may make his own.

The first step in lining up a lamp is to establish the correct mirror—aperture distance. This distance, measured

(Continued on page 34)

TABLE E. — CRATER C/P OF SPECIAL HEAT-CONDUCTIVE POSITIVES KNOWN AS "HIGH-BRIGHTNESS" CARBONS. EXCEPT FOR SPECIAL SITUATIONS, USE OF THESE CARBONS AT HIGHER CURRENTS IS GENERALLY IMPRACTICAL BECAUSE OF EXTREMELY RAPID CONSUMPTION AND HIGH COST OF OPERATION.

UNCOATED TRIM Pos.	Neg.	ARC AMPS.	ARC VOLTS	UNCOOLED CRATER C/P	COOLED CRATER C/P
9 mm	8 mm	150	75	100,000	80,000
9 mm	8	230	80	(Overloaded)	120,000
10 mm	8	165	80	110,000	85,000
10 mm	8	255	80	(Overloaded)	140,000
11 mm	8	195	80	120,000	95,000
11 mm	8	300	80	(Overloaded)	150,000
14 mm*	9	265	80	100,000	70,000
14 mm*	9	290	80	(Overload limit)	120,000
14 mm*	9	350	80	(Overloaded)	190,000
14 mm*	9	450	85	(Overloaded)	210,000
14 mm*	9	500	85	(Overloaded)	220,000
16 mm	10	500	90	(Overloaded)	200,000

*This carbon closely resembles 13.6-mm "Ultrex" positive manufactured and exhaustively studied by the National Carbon Co. In testing this "Ultrex" carbon with water cooled jaws, it was burned with a 5/16 inch (approx. 8 mm) negative at all currents up to 500 amperes.

In The SPOTLIGHT

PRACTICALLY every organized craft has its detractors, the majority of whom are the employing interests, and certainly the projectionist craft has taken its share of brickbats through the years. One of the more common epithets hurled at the craft has been their designation as "button-pushers," which term is hardly apropos in the face of the craft job done with the various new presentation processes.

Our close contacts with other crafts for many years has taught us that no group of workers gives so unstintingly of their time and money as do projectionists—often at midnight meetings—to the end that they may keep abreast of developments and thus deliver a better job.

Turning our thoughts in this direction was word of a series of lecture-demonstrations sponsored recently by IA Local 150, Los Angeles. Arranged by Business Representative Clyde W. Shuey, the lectures, under the "Carbon Arc Operation" heading, were given on three successive dates—February 2, 3, and 4—by Charley Handley, West Coast representative for National Carbon Co.

Local 150 members were notified by mail of the lectures and were asked to designate the date for their attendance, which was definitely not mandatory. The meeting room which seats 100-plus was on a standing-room-only basis on the first day, and well filled on successive days. In each case the discussion period lasted much longer than the lecture.

IP has long "sold" the idea of such gatherings and, in fact, has made the arrangements for scores of them. Congratulations, Local 150.

• Friendly labor-management relations received a boost recently at the farewell dinner the members of Local 324, Albany, N. Y. gave in honor of Charles A. Smakwitz, former zone manager for Stanley-Warner Theatres in Albany, upon his transfer to Newark, N. J. The Local presented Smakwitz with a traveling bag as a token of appreciation for his fair dealings during his tenure as zone manager in Albany—from 1926 to 1954.

In Memoriam
HARRY SHERMAN
March 3, 1952

• The recent mid-winter meeting of the IA executive board in Hamilton, Ont., was preceded by a banquet at the Connaught Hotel tendered by Hamilton Local 303 in honor of IP President Walsh and the members of the board. About 200 guests and their wives, including prominent civic leaders, were present. Toastmaster Fred Baldassari, member of the Hamilton Local, introduced the speakers, among whom were James Stowe, president of the Hamilton Trades and Labor Council, and Hugh J. Sedg-



IA President Walsh is shown here wearing one of a set of Hudson Bay blankets presented to him by A. L. (Pat) Travers, business representative of Taranto Local 173, at the recent dinner given in honor of Walsh and the members of the IA executive board. Looking on approvingly are Bert Higgins, recording secretary; James Sturgess, president, and Lou Lodge, Jr., secretary-treasurer, members of Local 173.



IA President Walsh poses with officials of Local 303, Hamilton, Ont., at the welcoming banquet Local tendered the IA executive board members during the recent mid-winter meeting. Seated, left to right: Hugh Sedgwick, 5th IA vice-president; Walsh; H. H. Tharnberry, president, and H. W. Usher, business representative. Back row, left to right: H. Konkle, member, executive board; S. James, vice-president; J. P. Owens, treasurer and A. Laughlan, member, executive board. Extreme right, unidentified member of Local 303.

wick, 5th IA vice-president (Canada).

Toronto Local 173 was host to the executive party at the close of the sessions at a dinner-dance held in the Indigo Room of the Barclay Hotel in Toronto. A highlight of the party was the presentation to President Walsh of a set of Hudson Bay blankets. Among the speakers at the Toronto party were Allister MacArthur, president of the Ontario Provincial Federation of Labor, and William Genoves,



Projectionists Local 348, Voncouver, B. C., donoted o motion picture comero to the Children's Hospitol in Vancouver, which will be used to toke motion pictures of the patients ot vorious stoges of treotment, thereby helping the doctors check on their progress. Locol 348 members, W. A. McCortney (center) ond F. M. Smith demonstrote the camero with potient Johnny Smith o. the subject.

president of the Toronto and District Trades and Labor Council. James Sturgess, president of Local 173, was the toastmaster.

• The long drawn-out negotiations between Local 302, Calgary, Ont., and Famous Players and Odeon Theatres were finally settled and new contracts were signed giving the projectionists an increase of 42c per hour, from $2.58 to $3.00 on a 33-hour work week. Hugh J. Sedgwick, IA 5th vice-president, assisted Local 302 in the settlement.

• We were sorry to learn that Joe Leavitt, charter member of Cleveland Local 160, has been hospitalized for the past several weeks. We wish him a speedy recovery.

• IA President Richard F. Walsh will receive the second annual Heart Award at the forthcoming dinner of the Variety Club of New York, Tent No. 35, which will be held at the Waldorf-Astoria Hotel on May 2. The announcement was made early this month by Edward Fabian and William German, officers of the Variety Club.

• At dinner with Lester Isaac, director of exhibition for Cinerama, the other evening the talk turned to the magnificent job done by the craft at large in putting over the various new projection processes. Lester, formerly director of projection and sound for Loew's, Inc., while lavish in his praise of current projectionist effort, said that we shouldn't forget the terrific contributions made by the veterans in the business.

This verbal tack brought us around, naturally, to the superb work done for the craft over the years by one who was not even a projectionist—P. A. "Better Projection Pays" McGuire. The many honors heaped on "Mac" by the organized craft would require a long list indeed, but we're always happy to salute "Mac," now in retirement at his home in Amityville, Long Island, N. Y.

• Among the IA men inducted in the Famous Players 25 Year Club at the company's recent dinner party in Toronto were the following: Victor Baldassari, Hamilton Local 303; Ed L. Dale, Windsor Local 580; Robert Manson and Arthur Milligan, Toronto Local 173; Edgar Osborne, Halifax Local 680; Mike Freeman, Peterboro Local 432; Albert Foster and Frederick Simmons, Vancouver Local 348.

• Under the terms of a two-year contract with the independents, members of Pittsburgh Local 171 will receive two weeks vacation with pay, plus an hourly wage increase of 5c for the first year and an additional 5c per hour for the second year.



Lester Motlock (right), member for the post 40 years of Local 294, Phoenix, Ariz., wos presented with o gold life membership cord in recognition of loyol and outstonding service to the local. Matlock served the Locol down through the yeors in various officiol copocities. The presentotion wos mode ot the Jonuory meeting by Don J. Fisk, treosurer of the Local ond lifelong friend of Motlock. Locol 294 members turned out en mosse to do honor to their brother member.

Trans-Lux Ends Rear Projection

The Trans-Lux theatre chain, which for many years was unique in that it employed rear-projection, is now converting to standard front projection for the installation of CinemaScope. It is estimated that the conversion job will cost $30,000 per theatre.



Shown here ore re-elected officiols of Locol 384 , Hudson Co., N. J., at the recent instollotion ceremonies, left to right: Rolph De Meo, business representative; Richard Honcox, member of Jersey City Local 59 ond instollotion officer; Fronk Mondrake, president, ond Albert De Titto, vice-president, Local 384.

The Development of the Motion Picture Projector

By THOMAS ARMAT

Nine out of ten projectionists, if asked who "invented" or developed the motion picture projector, likely would reply: "Thomas A. Edison." But he didn't; nor did he believe it possible to develop such a mechanism until he actually witnessed a demonstration. This and many other interesting points are included in the appended contribution by T. Armat, to whom is due the major share of credit for the development of a projector the basic features of which remain unchanged to this day. The Historical Committee of the SMPTE deserves credit for this absorbingly interesting contribution to the literature of the art.—EDITOR.

IT is difficult to trace to its beginning and fix a date for the conception of and idea that leads to an invention. Of the interesting impressions of my childhood, the one made by the toy known as the Zoetrope was among the most outstanding. The idea that its principles might be applied to producing a series of consecutive instantaneous photographs of objects in motion, so as to reproduce the motion, was suggested by something I had read, and the fascinating thought persisted in my mind until the Anschutz tachyscope I saw at the Chicago World's Fair in 1893 brought a realization of its actual accomplishment.

In the summer of 1894 I saw at Washington the first exhibition there of the Edison kinetoscope. It interested me greatly. About that time Mr. H. A. Tabb . . . endeavored to interest me in a business way in the kinetoscope. He gave me glowing accounts of the public interest in kinetoscope exhibitions and of the profits to be made therefrom.

After investigating the matter I told Mr. Tabb that I could not see anything very promising project, but scope as a commercial project, but that I could see a lot in a machine of the kinetoscope type if the pictures could be projected upon a screen, and that I believed that I could devise such a machine.

Liason With Jenkins

Mr. Tabb's answer to that was that he did not believe it was possible to project such pictures successfully, because . . . the Edison Company . . . had failed to do so, and he, therefore, did not believe it could be done. From what I knew of stereopticons it did not seem to me that the problem presented insuperable difficulties, and I began a research to find out all I could as to the state of the art and what, if anything, had been accomplished in the way of projecting such pictures upon a screen, at the same time starting preparations for experimental work.

In the Fall of 1894 I enrolled as a student in the Bliss School of Electricity of Washington, D. C., largely for the purpose of acquiring practical information as to handling an arc light that I proposed to use in my motion picture projection experiments. When I explained my purpose to Professor Bliss, he told me that there was another student in his school who was also interested in motion picture experiments. A few days later, at one of the classes, Professor Bliss introduced to me C. F. Jenkins, the student in question. Jenkins was a stenographer in the Life Saving Service, a branch of the U. S. Treasury Department.

Vital Shutter Modifications

It developed that Jenkins, with the cooperation and assistance of Professor Bliss and E. F. Murphy, the latter having charge of the Edison kinetoscope in the Columbia Phonograph parlors in Washington, had assembled a modification of the Edison kinetoscope, in which all Edison parts, films, sprockets, etc., were used. Jenkins called this peephole machine a "Phantoscope," and applied for a patent on it November 24, 1894. The patent was issued as No. 536,539 on March 26, 1895.

As the patent shows, the Jenkins modification differed from the kinetoscope only in respect to the shutter. Instead of using a rotating shutter with a slit in it for exposing the continuously running film over a stationary electric light bulb, Jenkins rotated the bulb itself. This modification accomplished no improvement in results. It amounted to a somewhat different way of doing the same thing in a somewhat less efficient manner. Its only virtue consisted in the possible avoidance of certain claims in the Edison kinetoscope patent, in which a specifically described shutter was included as an element. These claims were cited by the Patent Office against the Jenkins application.

Practically every night that we met at the Bliss School, Jenkins urged me to join with him in experimental work to develop a motion picture projection machine. He was fully convinced that a successful projection machine could be built upon the principle of the continuously running film of the Edison kinetoscope type of exhibiting machine. I was not so certain about that, but I felt that an experimental start had to be made and the sooner the better, and finally agreed on March 25, 1895, to join with Jenkins under an agreement which he prepared. In April or May of 1895 we completed a projection machine built on the kinetoscope principle. The machine turned out to be a complete failure, for reasons now obvious to anyone familiar with motion picture projection problems.

40-per-Second Rate

After that I took complete charge of further experimentation, at my own expense, and finally we produced the first projection machine ever made that embodied an intermittent movement with a long period of rest and illumination of the pictures on the film. Application for patent on this machine was filed on August 28, 1895, and later issued to Jenkins and Armat as patent No. 586,953.

The Edison films we used (the only kind obtainable then) were all taken

(Continued on page 31)

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CinemaScope, Wide Screen Lens Calculations

By JOSEPH F. HOLT
Member IA Local 428, Stockton, California

IN BOTH circuit and independent theatres the projectionist is frequently called upon to specify lens and aperture sizes for various aspect ratios. This requires an approach to the problem from a mathematical viewpoint; but frequently projectionists are unsure of the method to be followed. The writer, therefore, has set down in rule form some simplified procedures which will yield reliable results.

A common occurrence is when a representative of management enters the projection room and announces: "We are going CinemaScope and wide-screen in a couple of weeks. What lenses and apertures shall we order?" This is all too frequently met with an evasive reply which does not add to the confidence which management should have in projectionists.

Data Book a Prime Requisite

The first requirement for any well-run projection room is a data book recording all figures relating to the theatre. What is the aperture to screen distance? What is the proscenium opening? All figures known to be accurate should be kept in such a book, thus making possible speedy and accurate answers when problems of lens and aperture size arise.

Let us assume that we have such a data book, and that we have just been asked such a question as previously posed. We are now in a position to ask a couple of questions of our own. What is the desired CinemaScope aspect ratio? and what wide-screen height and ratio is preferred?

Frequently, management will rely upon the projectionists to answer these last two questions. At this point each man is on his own. In the writer's opinion, most theatres would do well to settle upon a 2.33 to 1 CinemaScope aspect, and a ratio for wide screen dependent upon the type of product used by the theatre.

Consider Type of Product

For instance, if cartoon shows are run often, or older product and reissues are used, a 1.66 to 1 ratio is advisable. Many theatres have adopted a uniform 1.75 to 1 ratio for all product except CinemaScope or Superscope; and it is well-known by now that the VistaVision release prints are composed for a 1.85 to 1 ratio. It is obvious, therefore, that we have a number of possible choices and that certain considerations enter into the final selection.

Take a look at the house which runs only current product and uses a news and cartoon as usual short product. A 1.75 to 1 ratio is sensible here; but 1.85 to 1 is possible in order to obtain uniform picture size when VistaVision prints are screened. Now, this is the type house with which we are concerned. Upon our recommendation, it is decided that 2.33 to 1 for CinemaScope, and 1.85 to 1 for wide screen will be adopted.

Our data book tells us that "throw" distance is 125 feet, and that the proscenium opening is 25 by 45 feet. Let's settle on 42 feet for the width, and since we selected 2.33 to 1, we divide 42 by 2.33 and obtain a CinemaScope height of just a bit over 18 feet. Fine, we say, 18 by 42 feet is a nice screen image size. Now what projection lens focal length is needed?

Figuring Conversion Process

The full aperture height of CinemaScope is 0.715 inch as compared with 0.620 for the old proportional aperture. Now we use the rules which we are developing here. Convert the "throw" distance to number of inches by multiplying by 12. In this case, a distance of 125 feet results in 1500 inches. We then multiply the "throw" distance in inches (1500) by the aperture size in inches (0.715) and obtain a product of 1072. We convert the desired picture height in feet to inches by multiplying by 12 — thus 18 feet by 12 gives us 216.

We divide the product of "throw" times aperture height (1072) by picture height (216), and obtain a quotient of 4.97, which is the focal length of lens needed. Let's ask for a 2.33 to 1 CinemaScope aperture and a 5-inch lens. Now, just a word about CinemaScope aperature dimensions.

Undersize apertures are available, such as 0.650 by 0.650 inch which provide any ratio to fit from 2 to 1 on up to 2.55 to 1, the full CinemaScope ratio. The writer has filed apertures up to dimensions of 0.695 inch which have the advantage of masking off editor's splice lines which in some product show up as brilliant white lines at the point of each editor's splice in the master.

In the present case, if we decide to mask down to 0.695 inch, we will ask for a 4.75-inch lens, knowing that we will come out with a height of 22 feet. If we have a screen 22 x 44 feet, all is well. But we have dropped our aspect ratio to 2 to 1 from the 2.33 to 1 we originally planned, and we will do well to stick with the 5-inch lens and a 2.33 aspect ratio.

The next set of rules is based upon ratios and is used as follows: we have selected a 5-inch lens for CinemaScope, and have decided to go to 1.85 to 1 for other product. The vertical dimensions of various aspect ratio apertures are as follows: 1.66 to 1 measures 0.497 inch; 1.75 to 1 comes to 0.471 inch; and the 1.85 to 1 dimension is 0.446 inch, and this latter we are using this time.

We do this: taking the aperture vertical dimension of 0.446 inch, we multiply by the focal length of the CinemaScope lens (5-inch) obtaining a product of 2.23. We divide this product by the CinemaScope aperture vertical measurement (0.715 inch) with a result of 3.12.

Sound Judgement Needed

This is where good judgment comes in, because if we order a 3-inch lens, we will have overlap on the screen masking, resulting in a ratio nearer 2 to 1, which is literally mayhem committed on all non-anamorphic product. So let's go for a 3.25 lens, after we repeat the last procedure, for a 1.75 to 1 aperture with a focal length of 3.29 inches indicated.

Result: we ask for a 2.33 to 1 CinemaScope aperture, a 0.471 by 0.825-inch aperture, a 5-inch lens, and a 3.25-inch lens for each projector we plan to use. Just in case readers wish to check results of their calculations, the writer submits computations for various ratios in the theatre submitted in his paper as an average problem: 1.66 to 1 ratio with aperture of 0.497 by 0.825 inch, a 3.5-inch lens; 1.33 to 1 with old aperture 0.620 by 0.825 inch, a 4.34 calculation, with a 4.25-inch lens and undersize aperture being used.

Ashcraft's New Cinex 170 Arclamp

By CLARENCE ASHCRAFT

THE CINEX 170 is a projection lamp so powerful that its operation in the higher current ranges, for which it was specifically designed, is entirely unnecessary for even the largest present-day drive-ins and indoor theatre screens. This new lamp has enormous reserves—for the inevitable wider films and larger screens of the near future. Only a relatively small portion of the light the Cinex is capable of delivering may be necessary now. In a short time, however, new processes may make the use of more light essential, when the reserve power of the Cinex will come into play.

Now is the time for a complete departure from previous ideas of lamp design. In order to have a long useful life, a lamp must be capable of accommodating not only most of the present carbon trims but also all new carbon sizes which might come out in the foreseeable future. High efficiency must be coupled with maximum operating economy.

Extreme Operating Versatility

The Cinex 170 may be operated with practically every size of high-intensity carbon now available or being considered, and can deliver to the screen the highest amount of light produced by these carbons. This lamp is capable of conforming with the following carbons and their operating loads:

9mm Standard High-Intensity Carbon .....at 80-90 amps.
10mm Standard High-Intensity Carbon .....at 90-105 amps.
10mm Special Carbon .....at 125-135 amps.
11mm Standard High-Intensity Carbon .....at 115-128 amps.
11mm Special Carbon (Future) .....at 150-160 amps.
13.6mm Standard High-Intensity Carbon .....at 140-170 amps.

The Cinex 170's are equipped with 18-inch reflectors, and when correctly aligned with a projector this lamp optical system provides a speed of F:1.64. This lamp will operate at its maximum efficiency when used with the new F:1.7 lenses, but even with the older slow-speed lenses, it will give greatly improved results.

Tests have shown the following results in light production:

With 10-mm H-I (or equivalent) carbon trim at 95-100 amperes — 34,000 lumens for CinemaScope aperture; 26,000 lumens (low range) for standard aperture.

With 11-mm H-I (or equivalent) trim at 125-130 amperes—36,000 lumens for CinemaScope aperture; 27,500 (normal range) for standard. (Use of 11-mm trim in other type lamps at 120-125 amperes produces approximately 21,500 lumens with standard aperture.)

With 10-mm "Hitex" (or equivalent) positive carbon at 135 amperes —36,000 lumens for CinemaScope aperture; 27,500 (normal range) for standard.

With 13.2-mm H-I trim at 160 amperes—41,500 lumens for CinemaScope aperture; 32,000 (high range) for standard aperture.

Additional Cooling Aids

In order to follow standard, comparable measuring procedure, these light readings were made with a 3.5-inch focus, F:1.7 lens, without shutters and without heat filters. However, for actual theatre operation it is definitely recommended that heat filters be used. The Cinex 170 is provided with the best available dichoric heat-reflector filters. It is further recommended that projectors be equipped with aperture gate air jets and, possibly, with gate water-cooling devices.

The Cinex 170 design is such as to realize maximum light output from the high collecting value of its 18-inch mirror. *Care must be taken so that projector housings and shutter frames will not interfere with the maximum passage of light.*

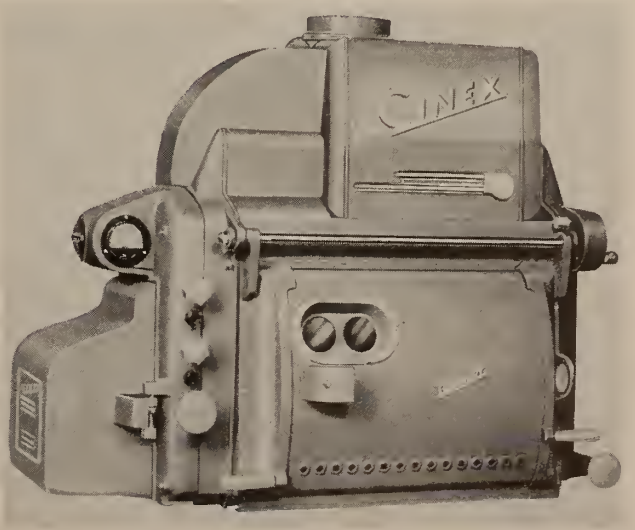
It may be seen from the test results that the Cinex 170 under optimum conditions will generate from 26,000 to 32,000 lumens through a standard 0.825 by 0.600 film aperture and from 34,000 to 41,000 lumens through a full 0.912 by 0.715 CinemaScope aperture. These are the highest values yet attained by any production type commercial arclamp which has come to our attention.

Despite its simplicity of design, the Cinex 170 lamphouse basic ruggedness guarantees very slight wear and tear of all parts, promising a long and economical operating life. The two solid silver contact jaws, both water-cooled, are practically indestructible. These jaws are located only ¾ inch behind the carbon crater, but they are so cool that they can be grasped by the human hand immediately after a 13.6-mm arc operating at 130 amperes is broken, indicating almost complete heat transfer.

Air-Circulating System

The Cinex 170 features a new air-circulating system. The lamphouse blower system takes cold air from outside the lamp and directs it in a carefully-designed pattern over the filter, through the hollow walls and ducts, across the reflector, and ejects it into the projection room exhaust stack.

This air-conditioning system keeps all parts of the lamphouse extremely cool, eliminates overheating of the reflector, steadies the operation of the arc flame, and makes the lamphouse



The new Ashcraft Cinex 170 projection arclamp is designed to permit an extremely wide range of carbon-trim selection, great flexibility and an overall cooling system which meets the needs of both indoor and outdoor theatres.

practically independent of the variable drafts from the projection room exhaust system.

The air which sweeps across the reflector keeps it cool, prevents undesired strains and stresses in the glass, prevents cracking and maintains the glass surface free of pit, soot and ash deposits. This method of air conditioning was used in the Ashcraft Air-Blast lamp (1927). Even after 20 minutes of operation at 180 amperes, the Cinex reflector may be touched and handled without any harmful consequences.

New Projection Vistas

The amount of light which can be produced with this new lamp may open up some new procedures in projection. Even allowing for heat filter, shutter and lens losses, it is possible to project CinemaScope pictures up to 80 feet in width and still maintain a brilliancy of 10 foot-lamberts at the center of the screen. With this amount of light, it may be possible to use white matte screens in order to improve the reflected light distribution pattern in the orchestra and balconies of large theatres.

For drive-in theatres, where 4 foot-lamberts seems to be the normal required brilliancy, these lamps assure well-lighted CinemaScope pictures having a width of 130 feet or more.

Todd AO Six-Track Sound

The Todd-AO company has definitely decided to use six-track magnetic stereophonic sound for its road showings Before the decision was made, both seven-track and four-track sound were considered.

Toll-Tv Row Spiced By FCC 24 Questions

NEXT month the film industry may get some ideas of what attitude the government will take anent the muddled and highly controversial plans to charge home Tv owners for some programs. The FCC will hear arguments for and against the toll-Tv idea and will, presumably, schedule formal hearings or act in some other way soon thereafter.

A committee of prominent exhibitors has declared itself absolutely opposed to toll Tv, claiming that it will destroy the motion picture theatre which provides paid-for entertainment without trespassing on the freedom of the air. Heretofore, the air waves have been regarded as public property, even though the radio and Tv interests have reaped lush profits therefrom for many years.

Three Competing Systems

There are at present three systems of toll or subscription Tv. Two of these. Phonevision, sponsored by Zenith Radio Corp., and Skiatron, sponsored by Tv film producer Matthew Fox, have applied to the FCC for commercial authorization. The third system, Telemeter, 80% owned by Paramount Pictures, has conducted tests in Palm Springs, Calif., during the past year, but it has not yet filed application with the FCC. Details of the three systems follow:

Phonevision, oldest of the three, was originally a system whereby an extra "unscrambling" signal was sent over telephone lines to the home. Zenith Corp. now has other methods in mind, including transmission of a coded signal which is decoded by means of a special device attached to the Tv set.

The Skiatron system envolves "scrambling" of the image at the transmitter. The jittery image steadies when a thin decoder card is inserted into a unit at the receiver. In both the Skiatron and Zenith systems, the code for unscrambling the picture can be varied at will to prevent evasion of the fee.

The Electronic Coin-Box

The Telemeter system is an actual coin-box method of collecting fees. An electronic coin-box attached to the receiver shows the type of program being offered and its price. Some improvements have been made in the coin-box system of late, one being that it can now offer "credit" to a customer so that he need not feed the box the exact amount required for a particular program.

The petition filed by Skiatron requests that toll-Tv be limited during the first three years to UHF (ultra-high frequency) channels for a maximum of 35 hours a week.

There is very little agreement among the groups sponsoring toll-Tv. Telemeter-Paramount did not join its two competitors in petitioning the FCC because they do not feel that the decoding gadgets used by the other firms are practical. Also, they feel that Tv stations should not be the only group to participate in the operation of toll-Tv.

Widely Divergent Opinions

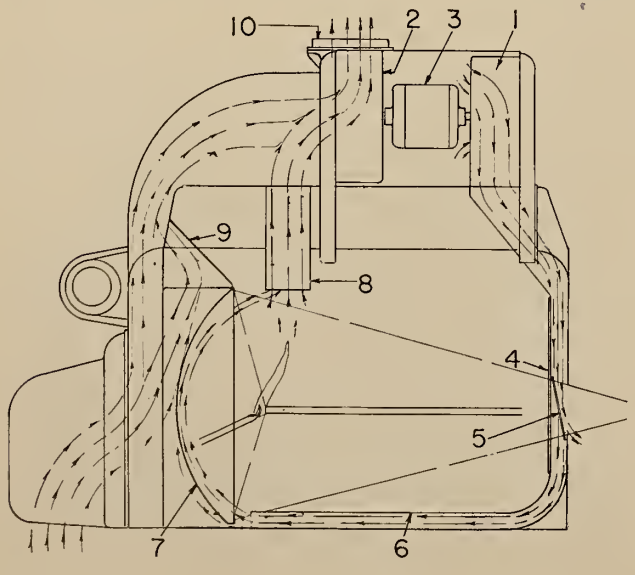
Telemeter holds that film exhibitors should be given the opportunity to participate because they've been selling entertainment; also, that franchise holders should include publishing and cultural interests and the broadcasters themselves.

In its Palm Springs test, the Telemeter system was operated from a local theatre, which fed a first-run film into home Tv sets over a closed circuit. The exhibitor showed this film in his theatre at the same time, promoting customers for both the theatre and toll-Tv.

There is also disagreement among Tv broadcasters concerning the merits of toll-Tv. David Sarnoff, head of RCA, which owns National Broadcasting Co., has repeatedly declared that he sees no future in trying to charge people for home Tv programs.

Many sponsors feel, however, that the cost of producing high-quality shows is so great that advertisers can no longer bear it alone. Also, that the added cost of producing color Tv shows is so great that traditional commercial-sponsor financing will not work.

Among the more than two dozen



AIR CIRCULATING SYSTEM FOR THE CINEX 170

Legend: 1—air injection blower; 2 — exhaust blower; 3—A.C. ball bearing motor; 4—removable front panel; 5—dichroic heat filter; 6—removable wide base duct; 7—18" reflector; 8—exhaust draft tube; 9—reflector air duct; 10—exhaust stack.

questions asked the petitioners by the FCC was one "disclosing the role to be played by the motion picture industry in subscription Tv." Other questions posed:

LAW: Whether the FCC has authority to authorize and regulate subscription Tv; whether the latter constitutes "broadcasting" under the Communications Act, or whether it is a common carrier or other type of service, and whether the FCC has authority to permit it to use channels assigned to Tv broadcasting; if the FCC does not have authority to authorize and regulate subscription Tv, what amendments to the act would be required to permit it.

Technical Data Sought

FACT: Technical data relating to the operation of proposed subscription Tv systems; possibility of degradation and interference with regular Tv service, and any adverse effect on Tv receivers now in the hands of the public; cost of equipment, including necessary modification of existing transmitters and receivers; cost to the viewing audience; means, methods and organizations intending to engage in toll Tv operations.

PUBLIC INTEREST: Whether subscription Tv will "generally encourage the larger and more effective use of radio in the public interest"; its impact on advertiser-sponsor broadcasting; its effect on broadcast of news and diverse views on controversial issues, and safeguards to insure that such broadcasting will continue to be available to the public without charge; safeguards to insure that the public will continue to receive well-balanced Tv programming without charge; safeguards to prevent monolopy.

Eastman Net Profit Soars

Consolidated net sales by Eastman Kodak Co. for 1954 amounted to $633,457,838, missing by only $200,000 the record sales year of 1953. Earnings before taxes were $144,968,534, an increase of 9% over 1953, while net earnings of $69,821,719 after taxes amounted to $3.99 per share compared with $2.86 per share in 1953.

GPE 1954 Profits Up Sharply

Net profit after taxes of $5,488,089 for 1954 is reported by General Precision Equipment Corp., parent company of International Projector Corp., Strong Electric Corp., Hertner Electric Co., J. E. McAuley, National Theatre Supply, and others. This compares with a profit of $3,436,349 for the previous year. Net sales for 1954 amounted to $123,322,634, compared with $87,763,925 in 1953.

Paramount's Biggest Earnings

Consolidated net earnings of Paramount Pictures Corp. for 1954 were the best in the company's history, being estimated at $9,003,000. This is nearly 50% higher than earnings for 1953, which were $6,779,563. Profits in 1954 included $832,000 from the sale and adjustment of investments in subsidiary and affiliated companies.

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LETTERS TO THE EDITOR

Variable Focus Lenses

To the Editor of IP:

I have read your magazine for many years and find it very helpful in keeping up with the latest happenings.

There are some things I'd like to ask about: first, I'd like to see an article by Robert Mitchell on the variable focus lenses. To me they seem the ideal lens to give a variety of screen aspect ratios. A short article last year on this subject (I believe it was by Merle Chamberlin) was good, but I'd like to have Mr. Mitchell's opinion.

ALFRED G. QUINN
Local 299, Winnipeg, Manitoba, Canada

EDITOR'S REPLY: Mr. Mitchell also enjoyed Merle Chamberlin's well-informed descriptive articles on variable-focus lens attachments. Since the appearance of Mr. Chamberlin's article (IP for October 1953, page 25), these useful attachments have been placed on the market. These are *supplementary* lenses, meaning that they must be used with the regular projection lenses.

Variable-focus attachments effectively *shorten* the focal lengths of the regular projection lenses to which they are attached; and the desired focal length or picture size is produced by sliding a knob at the side of the variable-focus lens tube.

As an illustration, the Wollensak Vari-Focus attachment gives any desired focal length from 4 inches down to 3 inches when put in front of a 5-inch projection lens. Other ranges of focal length are obtained by using the attachment with regular lenses of shorter or longer focus. The Pacific Optical variable-focus lens works the same way.

Practical Application

Mr. Mitchell's opinion is that variable-focus lenses are mighty handy things to have when several different aspect ratios are used. They spare the projectionist the trouble of changing lenses several times during the show. And there are other advantages, such as the elimination of masking troubles. The mere touch of a finger makes the picture exactly the right size for the screen being used.

"Imaginative projectionists," said Mr. Mitchell, "can produce a 'zoom effect with variable-focus lenses which provides a novel transition from one film subject to the next when the aspect ratio is to be changed during the show. It is only necessary to slide the lens-knob to increase or diminish the size of the picture before the eyes of the audience."

Many optical designers believe that a lens functions best at just one fixed focal length. Theoretically, these designers are correct, Mitchell assures us. The very highest resolving power and most desirable field characteristics are found only in *fixed-focus* lenses. But, he continued, the available variable-focus attachments give very sharp images at a minimum loss of light when used in conjunction with regular projection lenses of the best quality. They also minimize certain objectionable features of conventional short-focus lenses, such as small depth of focus. These attachments accordingly "hide" film flutter and focus drift.

Optical Principle Illustrated

The optical principle of variable-focus attachments may be demonstrated by means of simple lenses, as shown in the accompanying three sketches (Figs 1, 2 and 3).

In these diagrams the regular "fixed-focus" projection lens is represented by a simple positive lens (A), while lenses B and C represent the two optical elements of the variable-focus attachment. It is the front element of the attachment—lens C—which is moved by the sliding knob to alter the size of the projected picture.

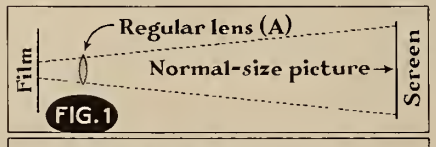


FIG. 1

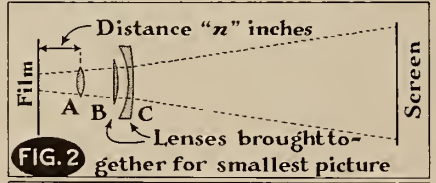


FIG. 2

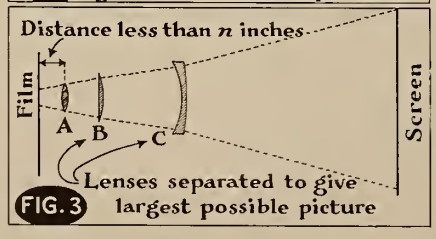


FIG. 3

Lens B of the attachment is positive (convex), while lens C, the movable element, is negative (concave on one side). The combination of B plus C is *weakly positive*, hence the longest focal length obtainable with the attachment is slightly shorter than the E. F. of the regular lens.

Now, when C is positioned as close as possible to B, the projected picture is only slightly larger than the picture obtained with the regular lens. (That is, the resultant focal length is only a trifle shorter than the focal length of the fixed-focus lens.)

Focal Length Shortened

But when C is moved away from B, the regular fixed-focus lens must be moved *just a little nearer the film* to get a clear picture on the screen. Moving the regular lens nearer to the film causes the rays of light to diverge—to "spread out"—a little more.

Since the refractive power of lens C remains the same no matter where it is positioned, the spreading of the rays continues all down the line right to the screen itself. The result is a bigger picture. (In other words, the resultant focal length has been greatly shortened by moving C away from B.)

Mr. Mitchell hopes that Mr. Quinn will get a chance to use the new variable-focus attachments and see for himself how nice they are.

Perspecta Sound Data

To the Editor of IP:

It is with much interest that I read articles in IP concerning new technical developments in the motion picture theatre.

With reference to your article by Mark Stevens on Perspecta Sound, I believe that a system such as this could be very well adapted to the reproduction of the full audio spectrum. As you know, some form of attenuation is employed either in the sound track or in the amplifier characteristic to enhance or favor the voice frequencies. Should a relay be actuated by a carrier frequency in Perspecta Sound, we could employ the full sound spectrum from the lowest to highest frequency for musical sections or a show by simply removing the feedback or attenuation from the circuit.

The writer has been accomplishing

this result by manual switch with excellent response in full flowing music at even low volume with no discernable loss at any frequency.

With regard to many of the problems now facing the exhibitor, it is indeed unfortunate that the important decisions in technical matters are not left to a committee of competent engineers, rather than studio heads, for a meeting of minds.

F. Russ
Park Theatre, St. Petersburg, Fla.

Editor's Reply: Perspecta Sound provides the same frequency response as regular high-fidelity optical sound, reproducing the full audio spectrum from the lowest tone (about 60 cycles per second) to the highest (about 10,000 cycles).

Fundamentals, Overtones

This complete range of frequencies is well balanced, and no special band is favored over any of the others. The *fundamental* range of voice frequencies is from 100 to 300 cycles, while the voice overtones necessary for the intelligibility of speech go all the way from 200 to 6000 cycles, which includes the greater part of the complete audio spectrum.

In certain types of wireless telephony, the voice harmonics in the 300-to-4000 cycle range are overemphasized in order to increase intelligibility; but this favoring of special frequencies destroys the *naturalness* of the sound, making voices rather harsh and "tinny," even though very distinct. This should not be done when naturalness is desired, as in movie sound.

Feedback Adjustment

Perhaps the attenuation Mr. Russ has in mind is that involved in the tone-balancing degenerative (negative) feedback circuits of the amplifiers. The feedback circuits are alterable to permit either the low or high frequencies to be attenuated, giving the exact kind of frequency response best suited to the acoustics of each individual theatre. The feedback adjustments are best made by the sound service engineer, and once made they need never be changed unless the auditorium is rebuilt, or the amplifiers are taken out to be installed in another theatre having different acoustical properties. Changing the frequency-response characteristics of a sound system may upset a delicate acoustical

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balance and destroy the naturalness of the sound.

Another type of attenuation familiar to projectionists is that produced by the "crossover" filter network associated with each speaker assembly consisting of low- and high-frequency units. The purpose of the filter network is to cut off the middle and high frequencies from the low-frequency speaker (called the "woofer"), and to cut off the low frequencies from the high-frequency speaker (the "tweeter").

Frequency Acceptance, Rejection

If a loudspeaker is fed frequencies which it is not designed to handle, it may get "rattled" and distort the sound. The characteristics of the filter networks are fixed, however, being set at the factory to match specific types of speakers.

It is not quite clear to us how Mr. Russ obtains the type of frequency response which he desires in musical reproduction; but at least we can say that we are in complete agreement with his opinion anent technological decisions being made by those best qualified to make them, *i.e.*, competent engineers.

Proper Lens Selection

To the Editor of IP:

As subscribers to IP, we seek your advice regarding backing (objective) lenses for our projectors in order to screen CinemaScope pictures. We operate Super Simplex projectors and have a projection throw of 350 feet. We desire to obtain a picture of approximately 68 by 30 feet.

We have been advised that we will require a 9-inch backing lens, which can be supplied by Kollmorgen Optical Co. (Snaplite Series II) on special order. As this is a slow lens we anticipate a loss of light, quite apart from that occasioned by the anamorphic attachment. However, we can increase our amperage to 165 amps, which will compensate somewhat.

Could you advise whether a 9-inch lens is the correct size for us.[2] We do not wish to rebuild our screen if we can possibly avoid it.

CHARLES MILLER
Johannesburg, South Africa.

EDITOR'S REPLY:

A 9-inch lens behind the anamorphic attachment will prove satisfactory, but will give a slightly smaller CinemaScope picture than the desired 68 feet by 30 feet at a throw of 350 feet. As a matter of fact, the specified picture-size has an aspect ratio of 2.267/1, which may be regarded either as not quite wide enough or as a bit too high. To get this aspect ratio on the screen, undersized apertures will have to be filed out to the required width.

The regular CinemaScope aspect ratios are 2.55/1 for magnetic-track prints, 2.35/1 for optical-track prints, and an undersize 2/1 ratio for both types of prints.

Assuming that optical-track CinemaScope prints are to be played in this drive-in theatre, and that 0.839 x 0.715 inch apertures (aspect ration 2.35/1) will be used, 9-inch lenses will produce a picture 65.26 x 27.80 feet at a 350-foot throw.

To calculate picture size for CinemaScope, the following formulas, *in which all dimensions and distances are expressed in inches,* are used:

$$\text{Height} = \frac{\text{Aperture Height x Throw x 2}}{\text{E.F. of lens}}$$

$$\text{Width} = \frac{\text{Aperture Width x Throw x 2}}{\text{E.F. of lens}}$$

These formulas may be "juggled" algebraiclally to find the E.F. (equivalent focal length) of lens needed to give a required CinemaScope picture height or width at a specified throw. To get a picture 68 feet wide at a 350-foot throw (optical-track CinemaScope aperture), a lens of 8.63 inches focus is needed. To get a picture 30 feet high at a 350-foot throw (same aperture), a lens of 8.34 inches focus is needed. Suppose, now, a compromise is made by using a lens of 8½ inches focus.

With an 8.5-inch lens (same throw and CinemaScope aperture), the picture will measure 69.09 x 29.44 feet. This is very close to the size specified by Mr. Miller. We therefore recommend 8½-inch lenses on the assumption that the throw has been correctly measured. If there be any doubt on this score, 9-inch lenses, which will give a somewhat smaller picture, should be used.



PERSONAL NOTES

W. Douglas Matthews has been appointed to the newly-created post of vice-president and general manager of Motiograph, Inc., manufacturer of 35-mm projectors and sound equipment. This appointment is part of an internal reorganization to achieve better supervision and control of the expanding activities of the company, which is soon expected to announce its entrance into the non-theatrical film field with a new product under development.

The former duties of Matthews as treasurer, are being taken over by John J. Bullers, accounting head, who will now function as secretary-treasurer.

M. J. ("Mike") Yahr has been appointed to the newly created post of manager of RCA theatre and sound products, headquartering at Camden,



M. J. ("Mike") Yahr wins RCA promotion.

N. J. Yahr will coordinate planning, promotion and sales activities for a wide range of products, including theatre equipment, visual and sound equipment, the "Tv Eye" and other closed-circuit Tv equipment. He joined RCA in 1929 as a theatre equipment field engineer.

Hollis D. Bradrury has been named Manager for RCA film recording equipment, succeeding Ralph A. Teare, recently advanced to Manager for RCA industrial products. Bradbury, with RCA since 1927, will coordinate all planning promotion and sales activities for film recording equipment and will also supervise the operation of RCA's recording studios in New York and Hollywood.

Paul R. (Pete) Wentworth has been appointed media buyer for Eastman Kodak Co. and will be in charge of market and media selection for Kodak advertising in trade papers, newspapers, general magazines and Tv. Wentworth joined Kodak in 1946 as a supervisor of the sales service division's literature distribution activities. For the past year he has served as assistant manager of the advertising department's package design division.



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Fox Plans to Make 16-mm CinemaScope Prints

After previously stating that it would not release any 16-mm versions of CinemaScope films, 20th Century-Fox is now expected to reverse itself because of the considerable financial loss involved in ignoring this market.

Most producing companies using CinemaScope make 16-mm prints from 35-mm "unsqueezed" negatives that are photographed at the same time the CinemaScope cameras are in action. In this way they are protected against distribution difficulties because they have all types of prints ready for release.

Equipment Problem

20th Century-Fox has a different plan for the 16-mm field. It is now working on the idea of releasing "squeezed" 16-mm CinemaScope prints. This approach would result in an equipment problem because there is no reasonably-priced anamorphic lens unit to use with 16-mm projectors. Bell & Howell did produce a combination taking and projection lens unit for 16-mm anamorphic films, but this lens is considered too expensive. However, Bausch & Lomb, which produces a wide line of CinemaScope lenses for studios and theatres, is said to be designing a 16-mm projection unit that will sell for about $100.

40,000 Projectors Used

A recent survey showed that there are more than 40,000 16-mm projectors being used in the United States and Canada. This figure breaks down into 19,000 in use at schools and colleges, 4,000 in shut-in institutions, 6,000 in towns without theatres, 1,500 Navy projectors, and 1,300 in use by the Army, Veterans Administration, Red Cross and similar organizations. Canada accounts for about 11,000 projectors.

New VV Horizontal Projectors Into N. Y. Paramount

Horizontal film-path projectors will be installed at the New York City Paramount Theatre and will be used first about the middle of April. The special double-size frame projectors are now being installed by the Century Projector Corp. This projector has gone through a complete design and development program at Century since it was first used experimentally at the Radio City Music Hall, N. Y. City, last Fall, but it is not yet known whether this Paramount installation indicates that other Par installations will follow.

Technical details of the improvements in the horizontal projector will be reported in IP as soon as possible.

Example of Closed Circuit Tv

An example of the growing use of this principle can be found in the method used by Dr. Norman Vincent Peale, pastor of the Marble Collegiate Church, N. Y. City and top best-selling writer for 118 weeks, in handling overflow crowds at his church. Closed-circuit Tv pipes his weekly sermons to listeners in several separate auditoriums.

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PROJECTOR DEVELOPMENT

(Continued from page 20)

at the rate of approximately 40 per second. The machine could not run the films at more than half speed, and it thus gave a slow-motion effect to all the scenes. It made a terrific noise. The sprocket and mutilated gear weighed more than a pound, and after a few experimental exhibitions the recesses in the driven gear were battered out of shape and made useless. The machine was never exhibited outside my office at Washington. I still have the original sprocket and mutilated gear.

Under date of August 30, 1895, Jenkins wrote his friend Murphy that the machine was a "grand success," but I regarded it as a complete failure so far as its having any commercial value was concerned, and addressed myself to the task of devising a practicable machine. This I accomplished a short time after the failure of the Jenkins and Armat machine, with a modification of the Demeny camera intermittent negative film movement, adapted to projection machine requirements. I hurriedly assembled a crude machine, tried it out and found it satisfactory. Immediately afterward I had a more substantial machine made, and with it gave a number of successful exhibitions in my office to friends and acquaintances. An account of this machine was published in the *Baltimore Sun* of October 3, 1895.

First Public Showings

In September, 1895, we took this machine to the Cotton States Exposition at Atlanta, Georgia. Subsequently I had two duplicate machines made and sent to us there for exploitation purposes. I obtained a concession from the Exposition authorities and built a theatre in the grounds for giving exhibitions, with the thought that receipts from the theater would help to pay the exploitation expenses. The anticipated Exposition crowds did not materialize, the receipts were

Theatre Tv and Broadcasters Vie for Rights to Fight

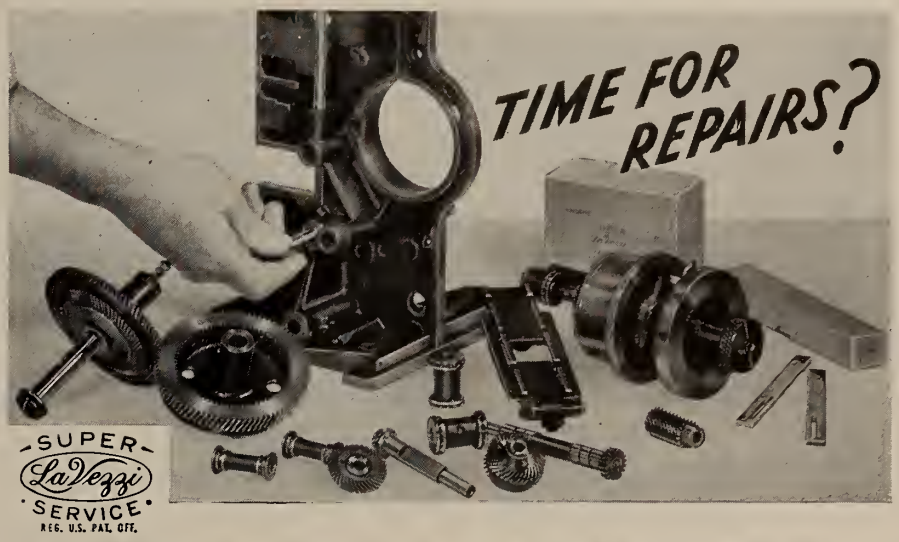
Theatre Tv interests and Tv broadcasting networks engaged this past month in a bitter competitive battle for the rights to telecast the forthcoming championship fight between Rocky Marciano and England's challenger, Don Cockell, scheduled for the week of May 16 in San Francisco.

The San Francisco location of the bout presents an intriguing opportunity to theatre Tv program producers because the populous New England and Middle Atlantic areas will not be blacked out for Tv. In this case, the fight promoters would probably permit theatre telecasts of the bout anywhere outside a 50-mile radius of San Francisco.

(P.S. The theatres won.)

OBITUARY

Clarence Hubert (Bert) Perry, 57, member of Local 634, Sudbury, Ont., Canada, was stricken with a heart attack early this month while working in the projection room of the Capitol Theatre in Sudbury. He was a former member of Toronto Local 173, transferring to Sudbury some years ago. Known in the industry as one of the top-notch projectionists in Canada, Perry's services were very much in demand. About a year ago he was presented with a gold watch by Famous Players Corp. as a member of the company's 25-Year Club. He was very popular in projectionist circles and his sudden death was a shock to his many friends.



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small, and a very considerable loss was incurred.

While at Atlanta, Jenkins borrowed one of the three machines, saying that he would like to take it to Richmond, Indiana, to give some exhibitions to his friends on the occasion of his brother's wedding, and that he would be back in a few days. Jenkins gave an exhibition with this machine in his brother's store in Richmond, as announced in the Richmond *Daily Telegram* of October 30, 1895.*

After Jenkins' departure from Atlanta I made some important improvements in the machine, including a loop, or slack-forming means, that improved the exhibitions and greatly reduced the wearing of the films. Subsequently I remodeled the machine, to give it a more commercial form.

*Editor's Note: It has been stated several times in the literature that C. F. Jenkins gave an exhibition with his projector at Richmond, Indiana, on June 6, 1894, but no proof of this earlier date has been obtained by the Historical Committee. A photographic copy of the Richmond Daily Telegram for Oct. 30, 1895 describing the showing on Oct. 30, 1895, is in the files of the SMPE Historical Committee.

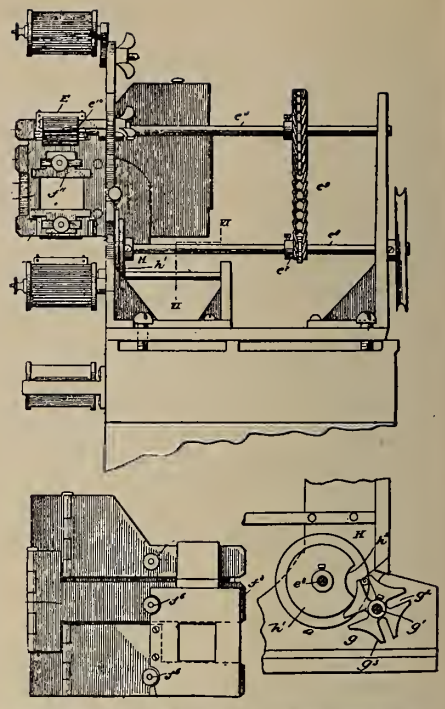
The Raff & Gammon Combine

In December, 1895, I got in touch with Messrs. Raff and Gammon of New York, who were the exclusive agents for the Edison kinetoscope and films. My idea was to arrange for a supply of films. In reply to a letter to them asking that they come to Washington to see my machine, I received an answer to the effect that they had no faith in motion picture projection machines, since they had endeavored to induce the Edison Co. to produce one and they had failed to do so, and they did not believe motion pictures could be successfully projected.

After a further exchange of letters Mr. Gammon agreed to come to Washington if I should pay his expenses, which I agreed to do. Mr. Gammon arrived with a sort of apologetic air of having been fooled into a wild-goose chase. When I took him into the basement of my office and threw a picture upon the screen, his attitude underwent a complete transformation. His excitement and interest were most apparent.

Prototype to Edison

The result of the interview was a contract under the terms of which Raff and Gammon undertook to furnish films and to manufacture a certain limited number of machines,



Drowings from the Armot Vitoscope patent No. 578,185, doted Morch 2, 1879, showing the Intermittent movement employing the star-wheel, or Genevo cross.

and licenses were to be granted upon a royalty basis to users of the machines and films, with territorial restrictions. No machines under any circumstances were to be sold. The Edison Co. was to make the machines from a model I was to send them.

Mr. Edison wanted to see an exhibition of the machine before details as to the number of machines to be made by him, the supply of films, *etc.*, were to be decided. It was arranged that I should give Mr. Edison an exhibition. I sent a machine over to the Edison Works at Orange, N. J., and later, Messrs. Raff and Gammon and I went over from New York to give the exhibition. The exhibition took place in a large room in the Edison plant and the sheet was a large one.

Edison Deal Arranged

Mr. Edison was obviously surprised at the excellence of the exhibition and so expressed himself. On the way back to New York Mr. Gammon told me that Mr. Edison had agreed to all our plans but expressed the opinion that we were planning to have more machines made than necessary. We planned to make eighty machines at first, but Mr. Gammon said that Mr. Edison believed that fifty machines would be sufficient to cover the country.

This oft-quoted statement might

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seem strange coming from a man of Mr. Edison's vision, but it should be borne in mind that up to that date (February, 1896) no pictures of outside scenes had been taken by the Edison Co. The scenes were all such as had been taken in the Edison "Black Maria," as they called it, a sort of open-air, black-lined stage adapted to be rotated so as to face the sun. The necessity for bright sunlight was largely due to the high speed of taking. The pictures were restricted to such as could be taken in the limited space of the small stage, and they were all of vaudeville subjects.

Debut in New York City

Arrangements were made by Raff and Gammon to introduce the machine, or rather its exhibitions, to the New York public, and I was asked to come to New York to supervise the installation and operation of the machine. This I did, and on the evening of April 23, 1896, I gave at Koster and Bial's Music Hall in New York, the first exhibition ever given in a theater of motion pictures as we know them today, embodying, as such exhibitions do, the feature of relatively long periods of rest and illumination of each picture on the film.

I personally operated the machine the first night. All the scenes shown, with one exception, were what might be called vaudeville turns, or stage subjects. A crowded audience applauded each of the scenes with great enthusiasm. The one exception to the stage scenes was an outdoor scene that Raff and Gammon had succeeded in getting from Robert Paul, who by that date was experimenting with motion pictures in England. This scene was of storm-tossed waves breaking over a pier on the beach at Dover, England—a scene that was totally unlike anything an audience had ever before seen in a theater. When it was thrown upon the screen the house went wild; there were calls from all over the theatre for "Edison, Edison, — — speech, speech."

A graphic account of the exhibition was published in the New York *Herald* of May 3, 1896, and previously to that date, on April 4 the New York *Journal* and the New York *World* published long accounts of the exhibition that I had given at Edison's.

Use of Edison's Name

It should be here stated that, by mutual agreement, it was decided that Edison's name should be used in connection with the machine. This was done partly for the commercial advantage of the prestige of his name and partly because he was the producer of and had patents pending covering the films, an essential part of the machine, that he was to supply.

Prior to this, when I had gotten the machine in all its detail into what I considered practicable commercial shape, I applied for a patent on it on February 19, 1896 and selected *Vitascope* as a name for the machine. This name was applied to a projection machine for the first time in this patent application, and it would seem that I added a word to the English language as the word *Vitascope* now appears in most modern dictionaries. The Vitascope, Edison Vitascope, so-called, made an immediate hit and was in great demand.

"Geneva Cross" Movement

Subsequently I invented and patented another projection machine with a greatly superior intermittent movement. This machine is shown in my patent No. 578,185 filed September 25, 1896, issued March 2, 1897. This intermittent movement is known as the "Star Wheel" or Geneva Cross movement, and it superseded all others by 1897 and is in use today in practically every motion picture theater the world over. It was not, however, a part of the Raff and Gammon arrangement, being a somewhat later development.

The intermittent movement has been called (appropriately I think) the "heart" of the motion picture projection machine. In the early days this intermittent movement of my patent No. 578,185 was used in the Edison Projectorscope, the Powers Cameragraph, the Vitagraph, the Lubin machine, the Baird machine, the Simplex machine, and many other early machines.

[TO BE CONCLUDED]


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PROJECTION LIGHT SOURCES

(Continued from page 17)

by stretching a tape-measure from the edge of the hole in the center of the mirror to the film-plane over the projector aperture, should be maintained to within one inch of the distance specified by the manufacturer. In certain cases, however, it is found that the brightest, most uniform screen light is obtained when the mirror-aperture distance is a trifle shorter than the specified distance, and the actual arc image formed a little beyond the aperture on the projection lens side.

In any case, users of reflector-type lamps should experiment with the mirror-aperture distance, moving the mirror toward or away from the aperture by slight amounts while projecting blank light to the screen. The position of the arc will also have to be shifted forward or backward to bring the spot in focus for the different mirror distances which are tried. The optimum position for the mirror is the one where the brightest and most uniform light is obtained on the screen.

If the mirror has the correct focal length, the optimum mirror-aperture distance thus found will be somewhere inside the permissible 2-inch range. If the best light is obtained by moving the mirror to a point outside this range, advice should be sought from the manufacturer of the lamp.

Proper "Working Distance"

In the case of some reflector lamps, especially the older models, the mirror-holder may be moved longitudinally. Other lamps have fixed holders, requiring the entire lamphouse to be moved on the lamp-table to change the mirror—aperture distance. With condenser-type lamps, the distance from the center of the outer condensing-lens surface to the aperture is specified as the working distance; and this distance depends on the type of condenser-assembly used.

As an example, F:2.3 standard aspheric condensers and F:2.0 high-speed condensers are optional in the Brenkert Model A 4 Supertensity arc-lamp. When the F:2.3 condensers are used, the converger-aperture distance is 15 inches; with the F:2.0 condensers 13⅜ inches. Because of possible small variations in the focal lengths of condensers the manufacturer of this lamp (R.C.A.) permits the complete condenser-assembly (containing two lenses) to be moved slightly toward the positive carbon. This distance must not be shortened any more than is absolutely necessary to obtain correct light distribution, as total screen illumination decreases as the collector-crater distance is shortened.

After the mirror-aperture (or condenser-aperture) distance has been determined, the alignment of all optical elements (mirror, crater, *etc.*) should be checked.

Use of Aligning Rod

The most dependable aligning tool is a long, straight steel rod having approximately the same diameter as the smallest carbon used. A dummy lens barrel having exactly the same diameter as the projection lens barrel is also required. This may be made of aluminum or seasoned hardwood, and it should have a hole of the same diameter as the steel rod bored lengthwise through its center.

When the dummy lens barrel is clamped in place, the glass is removed from the projection port, and the aligning rod inserted into the machine through the dummy lens. Careful measurements are required at the aperture to determine whether the lens holder is properly centered. In old heads designed for silent pictures, the center of the aperture may be displaced 1/20 inch toward the gear side of the mechanism relative to the axis of the lens.

Lamphouse Vertical Positioning

If, however, the aligning rod intersects the center of the aperture, the fire-shutter may be lifted, the rotating occulting shutter turned to get the blade out of the way, and the lamphouse dowser opened. Then the rod is pushed all the way back into the lamphouse to check on the alignment of carbon holder and mirror.

It is sometimes found that the lamphouse is positioned slightly too high or too low. This condition must be corrected by readjusting the supporting brackets. When old-style W.E. Universal bases are used, it may be necessary to place shims between the lamphouse base and the pedestal lamp-table to raise the lamp from ⅛ to ½ inch.

A fairly good idea of the alignment of a lamp may also be gained by simple sighting whenever the construction of the lamp permits a clear view along the optical axis from the rear of the lamphouse. For this purpose an assistant should shine a flashlight into the projection lens.

[TO BE CONTINUED]

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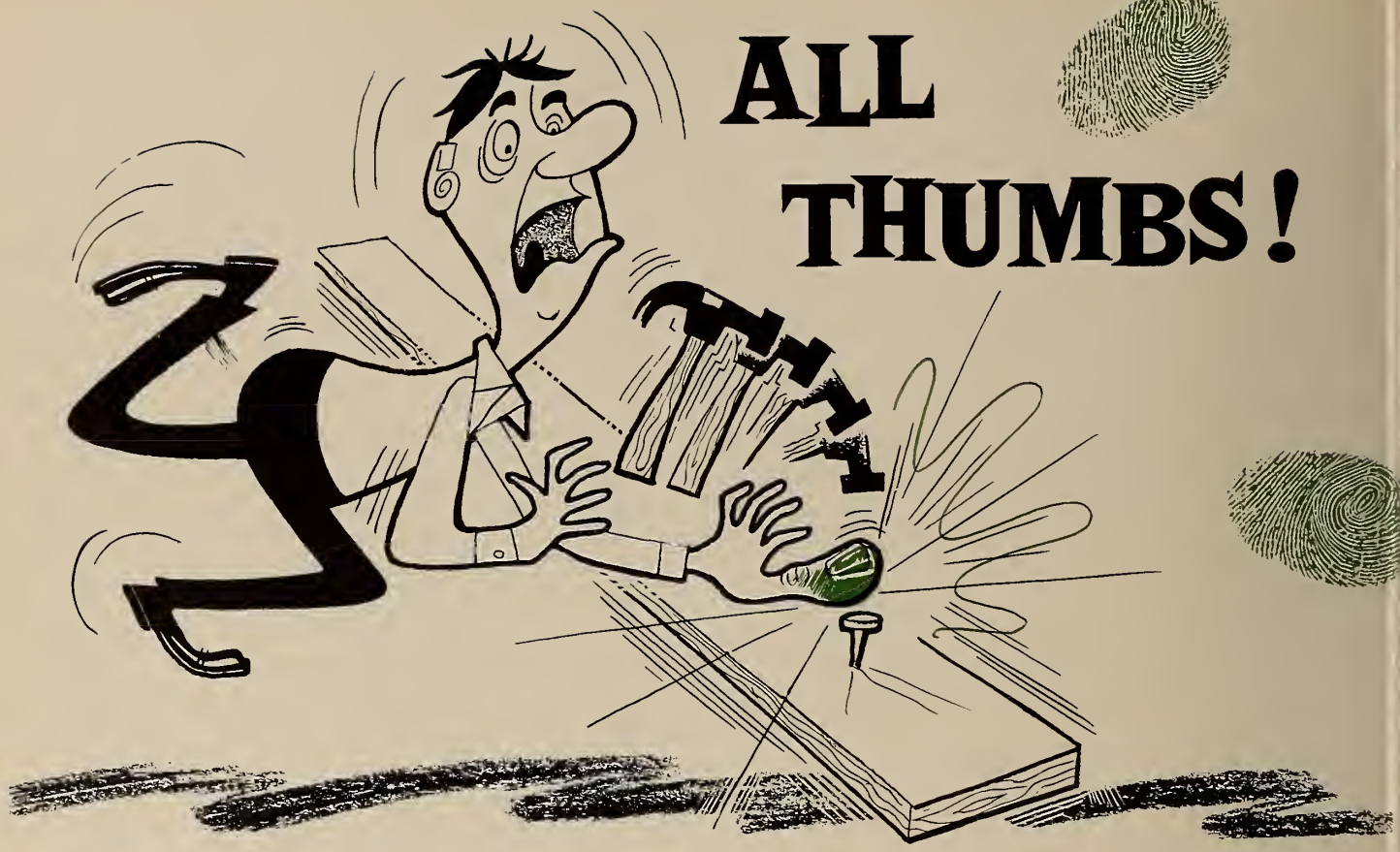
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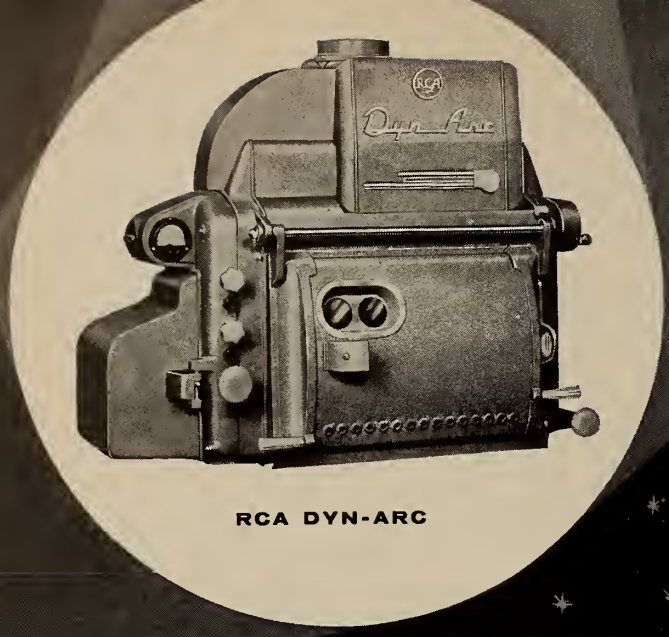
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Monthly Chat

EVERY projectionist knows that one of the most acute technical problems in motion picture exhibition today is the terrific heat to which the film is subjected as it hits the projector aperture. This problem has been gradually aggravated down through the years, particularly in the larger theatres which seemed never to be satisfied with the light level they were able to obtain.

Through the years, of course, various means were devised for minimizing this problem—improved film stock, altered lamp design, and various cooling methods including filters, water-cooled gates and blower arrangements. Also, lower-speed lenses were then more common. It seems today, however, that no degree of *individual*-company effort will lick this problem. *Collective* effort might turn the trick, but this seems to be a lost cause.

Other factors besides the intensity of radiant-energy flux (when radiant-energy flux is absorbed, it is "heat"), such as the type and past history of the film, and the spectral reflection and transmission characteristics of the optical system over the entire spectrum, affect its behavior during projection and have an influence on the appearance or non-appearance of undesirable effects of heat-on-film.

Experience shows, for example, that 7-, 8-, and 9-mm Suprex carbons which are all below the threshold of in-and-out-of-focus effects, have all quite generally been free from any heat-on-film problems. The 9- and 10-mm high-intensity carbons employed in the rotating-type mirror lamp have in some cases experienced difficulty and in others been free from it.

In the condenser-type lamps, the 13.6-mm high-intensity carbons employed have been free from heat-on-film problems only in the lower part of the current range. Also quite generally recognized is that this trim at the upper part of its current range, and also the 13.6-mm Hitex super high-intensity carbon, require some protection of the film from the effects of radiant energy.

It is definitely indicated that 9- and 10-mm Hitex carbons and the 11-mm Ultrex carbon in rotating-positive, mirror-type lamps, as well as the 13.6-mm Hitex super carbon and the 13.6-mm Ultrex carbon in condenser-type lamps, will project more radiant-energy flux through the aperture than can be accommodated by black-and-white film unless preventive and corrective measures are taken.

The use of infrared-absorbing filters, infrared reflecting filters, controlled air blast and the use of a water-cooled film gate have all been asserted to provide some protection to the film. Infrared-absorbing filters can remove 40 to 50% of the total radiant energy at the film aperture with an accompanying loss of 20 to 25% of the visible light. Some infrared reflecting filters can reduce the total energy at the aperture 30 to 40% with not more than 10% loss of visible light.

It has also been concluded that suitable air-cooling of the film might permit increases of 30 to 60% in the safe maximum light intensity. Multiple usage of more than one of these protective measures may be necessary with such extremely bright sources as "Ultrex" carbons.



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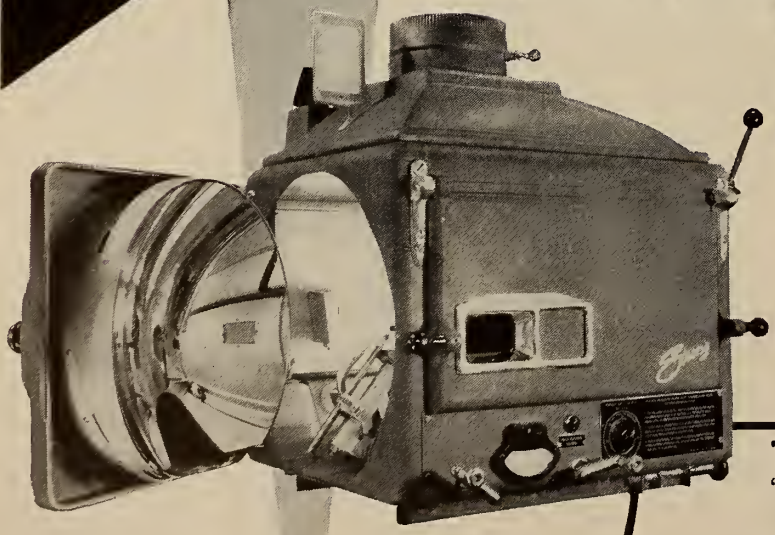
for theatres with f/1.8, f/1.7 or f/1.5 objective systems and projectors cleared for these high speed optical systems. Super "135" lamps are also available with 16-1/2" f/1.9 reflectors.

Unitized component design permits quick, simple changes to attain the correct light requirement for any of the various new presentation techniques, even two or more on the same program. Burn a choice of four different carbon trims; 9, 10, or 11mm regular trim, and 10mm Hitex in a total of seven separate manners to attain any desired degree of cost of operation, screen illumination, or burning time. Only one control is required for selecting any amperage within the range of a particular mode of operation. New, improved long life positive carbon contact. New ventilated reflector frame insures cool operation of reflector and rear section of the lamp even at extreme angles of projection.

New special blower fan keeps the Strong Infra Ban Beam Cooler at a low operating temperature by removing the light energy which is neither reflected nor transmitted, but is trapped in the filter itself. The filter is mounted on a new removable holder for quick removal and ease of cleaning. This Beam Cooler and blower permit a tremendous increase in usable light without a corresponding increase in heat at the aperture.

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INTERNATIONAL PROJECTIONIST

VOLUME XXX APRIL 1955 NUMBER 4

A Few Words on Diverse Topics

READERS of IP are fully conversant with Paramount Pictures' VistaVision process which involves shooting pictures on a 70-mm camera film negative and then reducing in the printing process to the conventional 35-mm positive film for projection purposes. This was originally proclaimed as standard V-V procedure enabling the showing of such releases "on standard equipment in any theatre in the world."

But when the Par people hove in Radio City Music Hall last Fall for their showing of "White Christmas" it retained its double-film image and projected it by means of the double-frame (70-mm) horizontal-pull projector[1] (Figs. 1 and 2). It is now apparent that despite the 60 feet wide by 32 feet high image at the Music Hall, Par and other producer-distributors still are enamored of mere "size" in the projected image, often without any regard for entertainment content.

57 x 27 Screen "Too Small"

Original negotiations for the current showing of "Strategic Air Command" at the Paramount Theatre in New York envisaged the showing of as large a picture as possible within the theatre's structural limitations. But evidently the distributors were horrified to learn that the maximum screen size obtainable would be 54 feet wide by 27 feet high, and this with wholly acceptable resolution and light level. This presentation would also have involved the use of double-frame film and horizontal-pull projectors.

The distributor's answer was: "Screen image not big enough." Result: the expenditure for destruction and construction in ripping out great chunks of the proscenium, as well as for the purchase and installation of new equipment, of $125,000.

The Paramount Theatre is now projecting a screen image 64 feet wide and 32 feet high, a gain of some 10 feet in width and about 5 feet in height over those dimensions originally obtainable.

In addition to the film-projector combination previously mentioned, the Paramount will use a new metalized screen fabricated by Raytone Screen Corp., new Peerless Hy-Candescent condenser-type arclamps capable of 180 amperes, the horizontal projectors made by Century, and sundry other equipment units.

The screen will be curved about 3½ inches; and a new gadget in the form of what the V-V people call a "curved aperture" will be used in the projector. Now, this aperture is not curved at all in the usual sense of the word (lying perfectly flat) but it will be curved at its top and bottom *lines* to resemble for all the world an almost exact representation of the CinemaScope screen image.

Understandably, such large screen

1 "The VistaVision Horizontal Projector," by Jomes Morris; IP for October, 1954, p. 16.

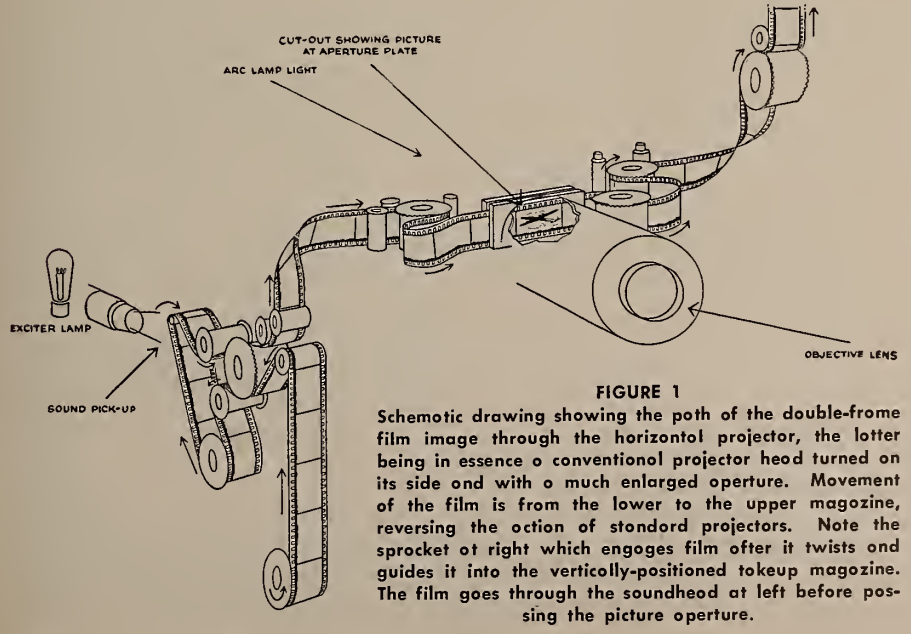


FIGURE 1

Schemotic drawing showing the poth of the double-frome film image through the horizontol projector, the lotter being in essence o conventionol projector heod turned on its side ond with o much enlarged operture. Movement of the film is from the lower to the upper magozine, reversing the oction of stondord projectors. Note the sprocket ot right which engoges film ofter it twists ond guides it into the verticolly-positioned tokeup magozine. The film goes through the soundheod at left before possing the picture operture.

images are suitable for only the largest theatres.

Move Poses Some Questions

IP is extremely doubtful about the efficiency of such installations, despite a rather detailed recital of its worth by the V-V- people. For one thing, it seems apparent that those few extra feet in width and height are going to be very costly percentage-wise in terms of screen image resolution and light level. Also, by encroaching upon the height of the aperture it would seem that Paramount is also encroaching upon that factor which is always ballyhooed as vital—screen image height. Easily forgotten, it seems, is that there is not only *projection* distortion but *viewing* distortion.

IP feels, however, that Paramount is entitled to prove its assertions as to quality by actual demonstration at the Paramount Theatre—an opportunity which did not present itself before this issue went to press. No other big theatres are clamoring for these data, so a detailed exposition herein of the facts as IP sees them can safely await looking and evaluating.

TOLL TV. This question which has all exhibitor groups in a dither these days has strangely failed to ruffle the feathers, in terms of active support, of the very people who might expect to be out doing battle against it—the Tv broadcasters, the talent groups, and the advertising agencies who reap scads of money from Tv shows and talent.

One sly old wag in the broadcasting industry has suggested to IP that maybe the reason for this apathy is because the aforementioned groups just don't give a damn. Consider, he added, the following hurdles for Toll-Tv to surmount:

Unfailing ample source of product; its distribution; cost of making and installing decoders on the reception end; collections, and last but not least the acquisition of suitable channels for broadcast, which feat seems at least a year removed from accomplishment. Then there is the vital factor of public resentment, because the Toll-Tv must elect one channel or other. A program is transmitted, then the screen goes blank—which means boom.

SCARE COPY. Some readers of IP were no little disturbed about our comments in last month's "Monthly Chat" in which we detailed our views about the steady, inexorable surge of producer-distributors of motion pictures now going to theatres in the direction of the Tv broadcasters.

No prophets we, nor prolific producers of "scare copy." We merely were reporting the facts as we see them while in the process of again pleading for our pet project of an all-industry conference to straighten out the kinks in thinking and procedure which have deviled our operations for the past several years.

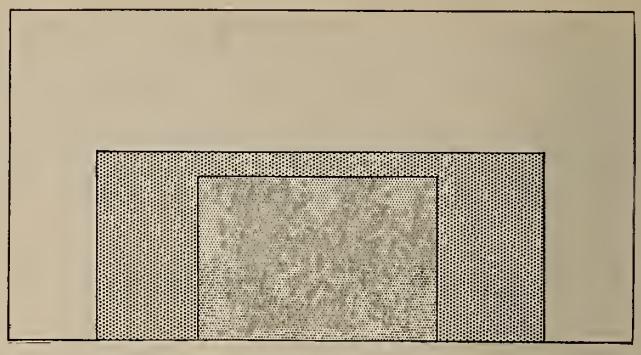


FIGURE 3
Sketch supplied by Paramount Pictures Corp., distributors NOT exhibitors, comparing the past, present and future screen sizes employed at the Paramount Theatre, N. Y. City, flagship of the theatre circuit. Implication of this sketch, as the DISTRIBUTOR sees it (backed up by positive statements in an accompanying press release) is that mere SIZE resolves all problems requisite to good projection. Questions and answers stemming from this press release are contained in the accompanying article.

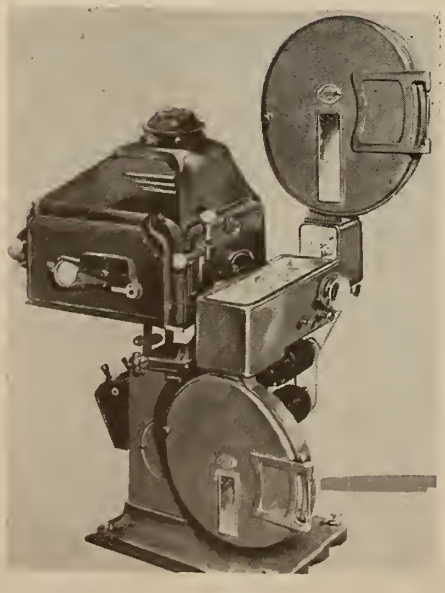


FIGURE 2
Overall representation of the double-frame-film, horizontal-pull projector as it appears when completely assembled ready for use. Note that it takes up only a little more projection-room space than a standard machine.

Elliptical Mirror Data

A VERY curious property of an ellipsoid of revolution (the solid figure created by the rotation of an ellipse about one of its axis) is its ability to bring to a focus *all* the rays emanating from a point at one of foci of the ellipse. The two geometric foci of an ellipse in reflection are optically conjugate, and a point source at one is imaged at the other by arbitrarily wide cones of light, and *without spherical abberation.*

This property of elliptical mirrors is very useful, for they can be made to collect solid angles much greater than possible with lenses, and to image the source, which must be comparatively small, without loss of light accurately where needed. This useful characteristic of elliptical mirrors applies only to the geometric foci and to small regions about the axis, so they are employed only with arc sources, where they collect more flux, but are less flexible than lens condensers.

In many incandescent filament condensing systems a spherical mirror is used to collect light which otherwise would be lost. The mirror is placed with its center of curvature in the plane of the filament, at which place the filament image will occur inverted.

The filament is thus imaged on itself with two effects: (1) the image can be shifted slightly so that the coil images fall between the coils, thus presenting a more uniform source to the rest of the system, and (2) by absorption the temperature of the filament is raised, making it brighter. This two-fold gain is possible only with sources possessing no dark region at the back as do arcs.

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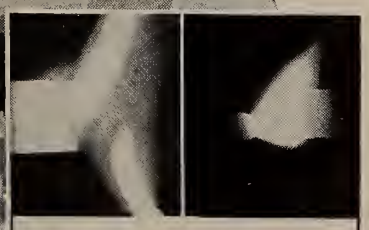
● Delivering sharp, bright pictures to the giant screens of drive-in theatres is a problem – even with the finest projection equipment. But there's a way you can meet this challenge of greater screen areas and longer projection throws.

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11mm x 20" H. I. Projector Positive	L 0109
13.6mm x 22" H. I. Projector Positive	L 0115
13.6mm x 22" "Hitex" Super H. I. Positive	L 0175



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Light Sources for Film Projection

The fourth and concluding article in a series which detailed the various facets of arclamp construction and operation. This installment is concerned particularly with the mechanical and electrical functionings.

By ROBERT A. MITCHELL

THE mechanical and electrical functioning of an arc-lamp is of equal importance to satisfactory screen illumination. Experience has shown that projectionists' complaints center most frequently on the arc-feeding mechanism.

Carbons are fed by means of two long helically-threaded shafts which, as they revolve, move the carbon holders closer to each other at a rate regulated by the feed-control motor. The speed of the motor is directly influenced by variations in the length of the arc-gap.

Provision is also made for focusing the arc (moving it to or from the collecting element) and, in regular H.I. lamps, for continuously rotating the positive carbon.

Feed Adjustment Critical

Adjustment of any carbon-feeding mechanism is usually very critical. Dirt and improper lubrication invariably decrease its sensitivity. There are so many different types of feed-control mechanisms that the projectionist should thoroughly acquaint himself with the mechanical structure and electrical circuits employed in his own lamps. Manufacturers' instruction booklets are absolutely essential to proper maintenance.

Several of the older low-intensity (L-I) and high-intensity (H-I) reflector lamps made use of a simple relay which closed an electrical circuit to actuate the feed motor whenever lengthening of the arc-gap permitted sufficient current to pass through relay-electromagnets connected in shunt ("parallel" or "multiple") with the arc. Hundreds of these equipments are still in use.

Arc-control relays of this type work fairly well when very carefully adjusted, but they are not sufficiently responsive to small changes in current to provide the most accurate control.

Constant-Feed System

Most "simplified" H-I arcs in use at the present time employ a "constant-feed" system whereby the speed of a continuously operating motor is regulated directly by the current flowing in the arc circuit. This is accomplished by means of a special motor having, in addition to a main shunt field-coil connected across the arc, a heavy-current control winding connected in series with the arc. All of the current that flows through the arc, therefore, must also flow through the series field-coil of the motor.

The lengthening of the arc-gap as the carbons burn away causes a decrease in the current flowing through the series field-winding, speeding up the motor in the same way that a decrease of regulating-field current speeds up any D.C. motor. The carbons then feed at a faster rate, and, as the gap shortens, the current through the series winding grows stronger and slows the motor.

The length of arc-gap which it is desired to maintain is regulated by means of a rheostat connected in series with the shunt field-winding.

The Varying Feed System

The better "simplified" H-I lamps provide a means of varying the feed rate of the negative carbon relative to that of the positive. Since the burning ratio of the positive and the negative *is different for every change in arc current*, such a means is absolutely necessary to prevent a gradual "creeping" of the arc to or from the mirror.

In most lamps the ratio of carbon-feeding rates is varied by a mechanical clutch; in others (notably modern European models) two separate and independent feed motors are employed, considerably simplifying the carbon-feeding mechanism.

No matter how carefully the carbon-feed mechanism is adjusted, however, there are times when drafts, variations in current, and irregularities in the composition of the carbons result in undesirable variations in the feeding. The arc-gap may unaccountably change in length, or the entire arc creep in one direction or the other. To overcome these difficulties, modern American rotating-positive, H-I mirror arclamps incorporate electro-optical carbon-positioning devices which insure a constant, unvarying position of the positive crater at the focal point of the mirror.

Now, these lamps, even though extremely high-powered (85 to 150 amps) and utilizing rotation of the positive carbon for perfect crater formation, are actually much easier to operate than the so-called "simplified" H-I arclamps which have neither automatic focus control nor rotating carbons.

Automatic-Focus Control

The automatic focus control in the Motiograph-Hall Hi-Power H-I arclamp, to mention a favorite representative of a class containing several excellent makes, consists of a bi-metal strip upon which an image of the burning arc is focused by a special

Error in IP Equation

On page 28, column 3 of IP for March there appeared an equation which by the inadvertent inclusion of the term "x2" at the end of the first line (relating to "Height") renders the statement wholly incorrect. Here is the passage and equation correctly expressed:

"To calculate picture size for CinemaScope, the following formulas, *in which all dimensions and distances are expressed in inches*, are used:

$$\text{Height} = \frac{\text{Aperture Height x Throw}}{\text{E.F. of lens}}$$

$$\text{Width} = \frac{\text{Aperture Width x Throw x 2}}{\text{E.F. of lens}}$$

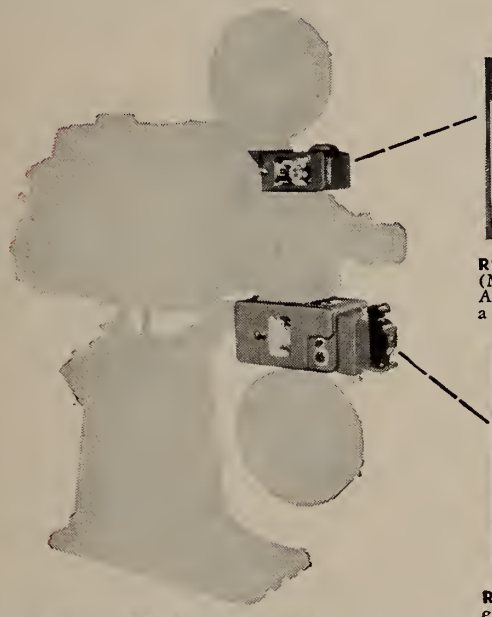
These formulas may be "juggled" algebraically to find the E.F. (equivalent focal length) of lens needed to give a required CinemaScope picture height or width at a specified throw."

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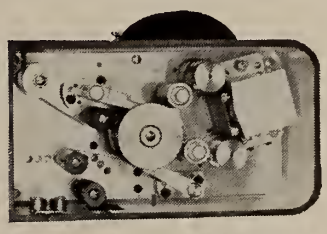
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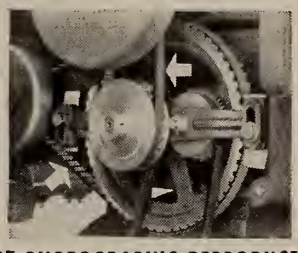
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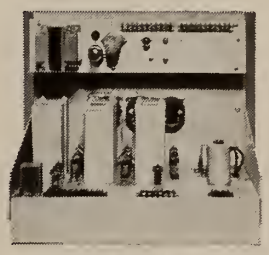
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R7 PHOTOGRAPHIC REPRODUCER gives unsurpassed reproduction from variable area and density prints. Special noiseless timing belts are an exclusive feature . . . will not slip or stretch.



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lens-and-mirror assembly. As the positive carbon burns back away from its correct position, the image on the bi-metal strip will shift, causing the strip to bend and establish an electrical contact which operates a solenoid to increase the feed rate and return the carbon to its normal burning position.

The bi-metal strip of the automatic focus control functions as a thermostat. Since the two metals of the strip expand unequally under the influence of the heat of the crater image, the strip bends to make or break the feed-motor circuit.

Once the arc is struck, this control maintains the correct feeding, and the need for frequent hand adjustment to prevent variations in light is eliminated. Even when power fluctuations occur, the automatic focus control adjusts the arc-gap quickly and accurately.

Other types of electro-optical feed controls employ photo-electric cells actuated by light, rather than heat.

Light Color the Tipoff

All arclamps contain an adjustment for focusing the arc and for centering the arc image ("spot") on the aperture. The arc is focused by moving it forward and back while projecting blank light to the screen, with the projector shutter running to reduce heat on the projection lens. It will be found that the light will be bluish if the H-I arc is too far from the mirror; yellowish if too close. In between these two extremes is a point where the brightest pure-white illumination is obtained.

When the optimum arc position is found, the arc indicator should be adjusted so that the image of the crater edge falls upon the indicating line drawn on the indicator card or screen. It will then be possible to bring the crater to this position without looking at the screen.

The spot is centered upon the aperture by means of the horizontal and vertical mirror-adjustment knobs. Most rotating-positive, H-I lamps, however, utilize different methods of centering the spot.

The condenser-type lamp is optically the least critical: once the burners have been aligned and the condensers properly adjusted vertically, laterally, and longitudinally, no variation in the position of the spot will normally occur. The rotating-positive, mirror H-I arc, on the other hand, may require more frequent centering of the spot. This was particularly true of the old "Hi-Lo" lamp, which had the usual mirror-adjusting knobs. But in modern lamps of this type, the alignment of the positive carbon is so accurate that the mirror-moving arrangement is eliminated in favor of a smaller horizontal and vertical adjustment of the entire burner assembly.

Lamphouse Ventilation Vital

Lamphouse ventilation is a matter of the utmost importance in these days of H-I arcs. Among the several gases generated by the H-I arc are oxides of nitrogen. These are so poisonous that the vent chimneys of these arclamps *must* be connected to an adequate exhaust system to protect the health of the projectionist. An exhaust capacity of about 400 cubic feet per minute is regarded as the minimum requirement for two lamphouses. Most natural-draft flues found in theatres are wholly inadequate for the job.

It is nevertheless true that in many cases improper ventilation of the lamphouse interferes in a very serious manner with the stability of the arc stream, hence reacts unfavorably upon the brightness of the positive crater, causing the light to flicker. The arc stream is an arc of hot, electricity-conducting gas which is readily affected by drafts. In severe cases, currents of air rupture the stream completely, extinguishing the arc.

There should be little trouble with down-drafts in a well-designed ventilating system; but if the arcs are seen to flicker on windy days, the dampers should be closed off to a point just below the amount needed to prevent drafts from disturbing the quiet burning of the arc. The only feasible remedy for extreme irregularities of air-flow is the use of cone-shaped directional hoods over the chimneys of the lamphouses.

Lamphouse 'Housekeeping'

Arclamps operate dependably only when they are kept scrupulously clean. The arc dust which smuts the mirror and inner walls of the lamphouse and settles upon the gearing, impairing smooth operation, comes from the cores of the carbons. The large cores of H-I positive carbons are composed of a mix of soft carbon and rare-earth compounds which function as flame materials. Without these flame materials there would be no high-intensity effect.

Now, the rare-earth compounds in the positive cores are oxidized by the intense heat of the arc to create an ash in the form of a fine white dust. Chemical analysis reveals that this dust consists of ceric oxide and thorium dioxide together with smaller proportions of the sesquioxides of other rare-earth metals. The carbon present in the cores burns to carbon-

(Continued on page 32)

Modified C'Scope Lens For a 645-Foot 'Throw'

NEWS ITEM: Specially designed lenses 3 feet long and supported by a special tripod have been installed in the Corpus Christi Drive-In Theatre, in Texas. The lenses, to accommodate a projection "throw" of 645 feet, are said to cost $2,000.

Here are the facts anent this special lens, as supplied by Bausch & Lomb Optical Co.:

"We receive numerous inquiries from drive-ins which for CinemaScope projection require long-focal length, high-speed prime lenses. This condition exists wherever the screen size is limited or the 'throw' is long (and we have heard of some 'throws' approaching 700 feet) because of the most desirable location of the projection room or because the theatre is just plain big.

"It goes without saying that such spots need all the lens speed they can get, and in focal lengths beyond 7 inches this means larger diameter prime *and* CinemaScope lenses that can be squeezed into a 4-inch hole.

Modification Not a 'Gimmick'

"We have been able to neatly sidestep this dilemma by a factory modification of our large CinemaScope lens (at a net extra cost of $135 for each lens) which permits using a standard prime lens of exactly one-half the focal length called for in the standard table—that is, a 4 instead of an 8-inch, a 5 instead of a 10-inch, *etc.* This is not a 'gimmick' but is based on sound optical design principles and thus does not affect screen size or picture quality. By the same token, it does not give anything extra in those situations where existing high-speed Super Cinephor lenses can be used.

"Admittedly, 700-foot 'throw' drive-ins are not common; but the foregoing information will save many existing theatres considerable expense in lens equipment for CinemaScope."

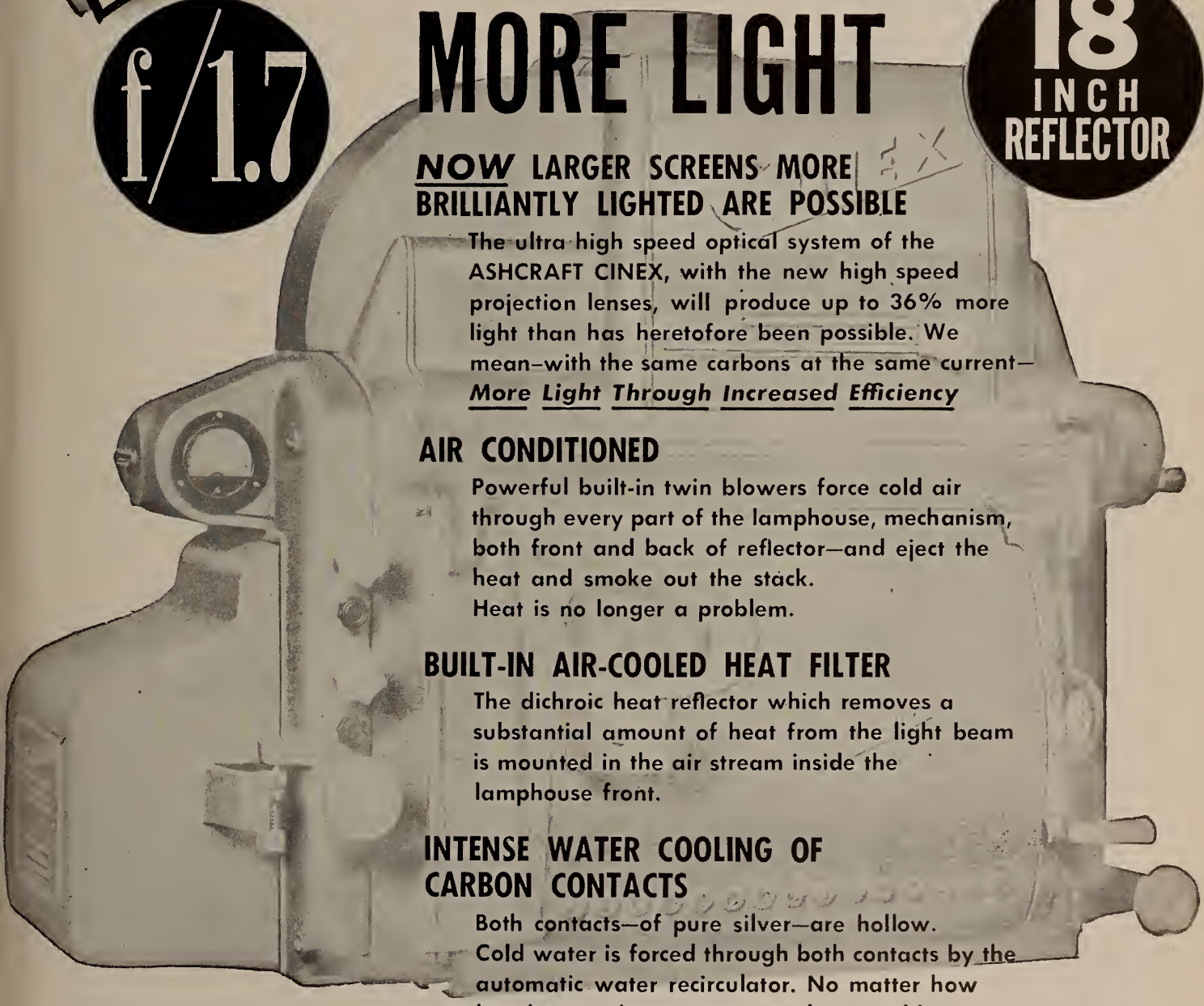
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More Light Through Increased Efficiency

AIR CONDITIONED

Powerful built-in twin blowers force cold air through every part of the lamphouse, mechanism, both front and back of reflector—and eject the heat and smoke out the stack.
Heat is no longer a problem.

BUILT-IN AIR-COOLED HEAT FILTER

The dichroic heat reflector which removes a substantial amount of heat from the light beam is mounted in the air stream inside the lamphouse front.

INTENSE WATER COOLING OF CARBON CONTACTS

Both contacts—of pure silver—are hollow. Cold water is forced through both contacts by the automatic water recirculator. No matter how hot the arc, the contacts are always cold.

CINEX 170 IS THE FIRST and ONLY ALL PURPOSE PROJECTION LAMP

60,000 LUMENS WITH WIDE APERTURES — *PREPARE YOUR THEATRE FOR THE FUTURE*

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Wider Screens in Drive-Ins†

The conversion of Drive-In theatres to CinemaScope is discussed herein, with emphasis on the size and surface of the screen, the light source and the possible use of multi-channel sound. Proper procedural steps are outlined.

By RALPH H. HEACOCK

Manager, Theatre Equipment Products Section of RCA

USE of the wide screen in drive-in theatres is now widespread. Although there may be some question relative to the use of multiple-channel sound, apparently most agree that the wide screen is one thing that is immediately noticed and receives favorable comment from the theatre patrons. Because of this broad acceptance of the wide screen in *indoor* theatres, the year 1954 was marked by the introduction of the wide screen in the drive-in theatre.

Drive-in theatre screens for use with the conventional 1.33 to 1 aspect ratio pictures have varied in width up to about 70 feet. During 1954 the width of drive-in theatre screens have very materially increased. The Westbury Drive-In Theatre at Westbury, Long Island, N. Y., was built during the past season, with a capacity of about 2,000 cars. The screen, seen in Fig. 1, is curved and is 124 feet wide. When a CinemaScope picture is projected, it overshoots the screen on each side by about one foot, and it completely fills the screen from top to bottom.

This gigantic picture is simply standing out in the sky, and all 2,000 of the cars in the theatre have an unobstructed view. When a conventional picture is projected, it fills the screen from top to bottom, and the width is somewhat reduced in size.

Figure 2 shows the screen at the Belmont Auto Drive-In Theatre, near Dayton, Ohio. This screen is about 110 feet wide and is flat. Here again the CinemaScope picture completely fills the screen, while the conventional picture runs the full height of the screen but not the full width.

Diffusive White Screen Surface

It is very interesting to note that both of these screen surfaces are of a white diffusive material. Many who have compared the screen image in these theatres with that obtained on a silver screen feel that both color contrast and color balance are better on a white screen. Some have commented that light distribution on the flat screen is highly satisfactory, and that there apparently is no serious fall-off in brilliancy.

Recently a screen coating material has been developed which is a real vinyl plastic material (not merely a vinyl base). This type of material was used to "mothball" the U. S. Fleet and the B-29 planes after the war. This material has been pigmented so that a mirror coat is sprayed onto the screen surface, which is then followed by a top coat which is brilliantly white and diffusive.

Cracks between panels of the existing screen are sprayed with a coat of the mirror material, and are then taped and resprayed so that the tape becomes an integral part of the screen imbedded right in the mirror coat.

The end result is that a screen surface is obtained which has practically the same reflectance as a high-grade, indoor, white diffusive screen. In addition, the material has been formulated to be highly weather-resistant. This material should be of great help in establishing high quality, high reflecting, diffusive white screens for CinemaScope use in outdoor theatres.

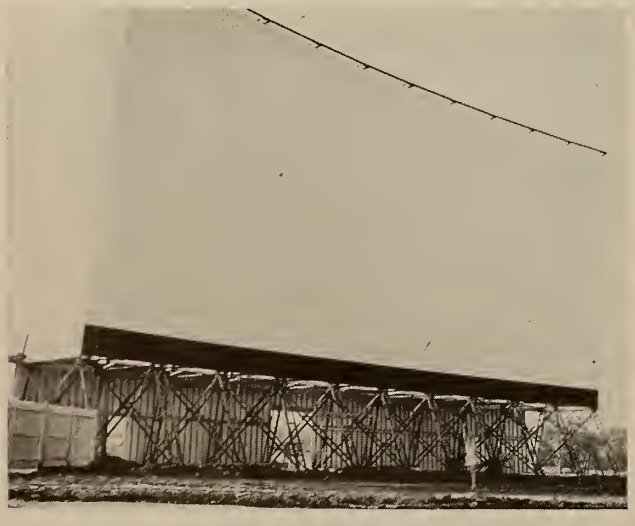
Light Requirements Stringent

The second problem in the operation of drive-in theatres of this type is a suitable light source which can provide enough light to illuminate acceptably these very large screens. In both of the outdoor theatres described, a very dependable arclamp is employed. The same arclamp may be employed for use with either the 10-mm Standard, 11-mm Standard, or the 10-mm Hitex carbon.

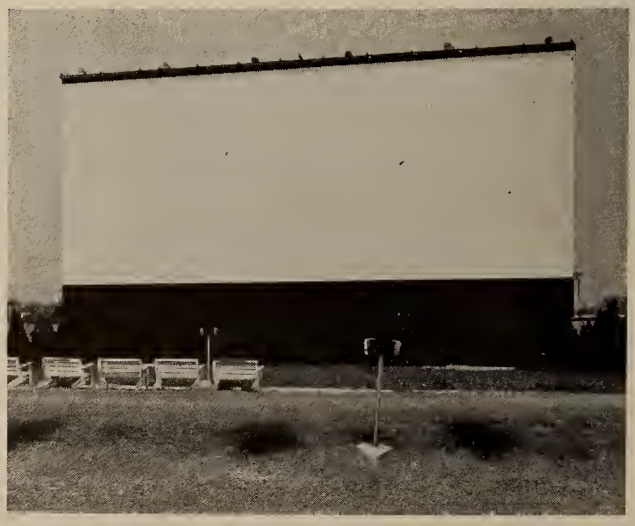
A precision-made 16-inch diameter glass reflector is employed which accurately focuses the positive carbon crater on the projector aperture. The screen end of the arclamp is equipped

(Continued on page 31)

† Journal of the SMPTE, Feb., 1955.



Two examples of modern drive-in theatre screen installations. FIG. 1 (left): the 124-foot curved screen installation at the Westbury, Long Island, N. Y. FIG. 2. The 110-foot flat screen at the Belmont Drive-In at Dayton, Ohio. One flat, one curved.



The Development of the Motion Picture Projector

The concluding article of two which trace the development of the first truly practicable motion picture projector, as recounted by a world-famous practitioner in the art.

By THOMAS ARMAT

THE RAFF and Gammon licensing arrangement started off auspiciously and financial returns were satisfactory, but troubles developed shortly. None of my patents had been issued at that date, and the applications were still pending in the patent office, two of them involved in "interferences". No patent protection could be given until patents actually issued.

Piratical machines began to appear, and in the absence of patents, could not be stopped. Later on, the Edison Co. began to be slow in supplying films. For this reason, among others, friction developed between the Edison Co. and Raff and Gammon. Still later, the Edison Co. began to market a machine that infringed my pending patents.

As soon as my patents issued, I organized a company to which I transferred my patents. Warnings were sent to infringers, and legal suits were filed. Often the suits were rendered fruitless by the simple expedient of "fading-away" by the sued infringer. The Edison Co. was making and selling many machines, called *Projectorscopes*, which infringed no less than three of my patents.

Bitter Legal Battle Begun

We demanded from users of the machines prompt payment of royalties. The Edison Co. notified users of *Projectorscopes* that they would be protected against any legal suits. That made it obligatory that we sue the Edison Co.

Meanwhile, a suit we had brought against the Biograph Co. was decided in our favor, the defendant being enjoined. On the strength of that decision, an injunction was obtained against the Edison Co. The later had pending in the U. S. Patent Office an application covering the only successful method of taking motion pictures, plus an application covering the perforated film.

So long as the Edison Co. and we were fighting each other, no exhibition could be given without risking a suit by one side or the other. I repeatedly emphasized to Edison the obvious advantages of our getting together on some basis that would not involve the *sale* of projection machines; but without avail. After we obtained the injunction against Edison, they tried in devious ways to obtain a license from my company under which they would be permitted to sell machines. I would not agree.

From the beginning I refused to sell machines, or to license others to do so, because I felt that whatever advantage we had under our patents would be destroyed thereby; also, I felt that any profit we might make out of outright sale would not be remotely commensurate with continuing *earning power*. I wanted a royalty from exhibitors, small enough in itself, but which in the aggregate would net a handsome income.

Biograph and Edison Sued

The suit against Biograph was for an injunction and damages of $150,000. Damages were also asked of Edison. Both companies posted bonds and prepared appeals. While damages in patent suits are rarely collectible, a favorable decision in an injunction suit where damages are claimed creates a very uncomfortable feeling on the part of the defeated party and by the holders of any of their securities.

The American Mutoscope and Biograph Co. had outstanding a bond issue of $200,000. Some of the bonds were held by the Empire Trust Co., of New York, who took notice of the success of our suit for injunction and damages against the Biograph Co. After consultations with all interested parties, a stock company was formed to take over all valuable patents in the art, the stock to be distributed to the patent owners. It was a closed corporation: the stock was placed in escrow, and none of it was sold.



Courtesy, Ray Brian, Local 434

The Armat "Vitascope," first used publicly in 1896, established the basic principles of motion picture projection and inaugurated the commercial phase of the film industry.

This holding company was the Motion Picture Patents Co; and the principal beneficiaries were the Edison Co., the Biograph Co., and Armat Moving Pictures Co. I owned most of the stock in the latter. The Patents Co. was an immediate success. The royalties collected put no burden upon the industry, but resulted in a large net revenue to the Patents Co. A royalty of ½c a foot was paid by the producers, and a royalty of $2 a week was paid by the exhibitors.

'Nickleodeons' Pay Royalty

When the Patents Co. was formed, there were in the U. S. A. between 10- and 12.000 small theatres, or "nickleodeons," as they were called. The royalty of $2 weekly was a negligible sum to them; but as it was collected without cost to the Patents Co. by the simple expedient of having the distributors add this amount to their weekly film rentals, it amounted to a practically net revenue of between $20- and $24.000 weekly. The revenue of ½c a foot as film royalties also amounted to a handsome total. Unfortunately for the stockholders of the Patents Co., its life was rather a short one.

Some of the producers, for reasons I never quite understood, were refused licenses by the Patents Co. These producers, calling themselves "independents," formed an organization and put up an all-around fight. At that date anything that smacked of being a monopoly or trust was very unpopular with both the public and the courts.

Patents Company Dissolved

The "independents" charged the Patents Co. with being an unlawful monopoly under the Sherman anti-trust law, and instigated a suit by the Government against them. Judge Dickinson decided, in substance, that while a patentee had a legitimate monopoly within his patent claims, he could not, under the Sherman Act, lawfully *combine* his patent with other patents. The Patents Co. was ordered dissolved.

I have always felt that Judge Dickinson's decision was largely influenced by the fact that the Edison Co. had sold thousands of projection machines without restrictions as to their use, in some instances *guaranteeing* the right to their

(Continued on page 29)

The Improved Strong '135' Projection Arclamp

First publication anywhere of important changes in the design, construction and increase in operating efficiency effected in the Strong "135" projection arclamp now available to the trade.

By ARTHUR J. HATCH

Vice-President in Charge of Engineering
THE STRONG ELECTRIC CORPORATION

THE improvements effected in the design and construction of the latest Strong "135" arclamp are the result of steady engineering progress spurred on by the ever more severe demands by the projection field in order to cope successfully with the new techniques.

This is not to infer that every change in technique requires the abandonment of those basic principles of design, construction and operation of arclamps which over the years have proven their worth—a statement as applicable to the Strong lamp as it is to other equipments.

For example, retained in the improved Strong "135" are those salient features which have distinguished its predecessors, such as automatic positive carbon crater-positioning, single-adjustment carbon feed control, burner base focusing whereby the arc-gap is not disturbed when focusing the lamp on the aperture, and simple, sharp-line construction which enables the projectionists to keep the lamphouse clean.

Automatic Crater Positioning

Before presenting the run-down on the outstanding features of the improved Strong "135," the writer states that our review of the wide acceptance accorded the 16½-inch diameter reflector lamp which we have been manufacturing for the last five years is due in no small measure to the automatic carbon crater-positioning unit contained therein. This device will continue to be a vital feature of the improved 18-inch and 16½-inch reflector lamps which will be delivered henceforth.

Outstanding features of the improved Strong "135" are as follows:

1. 18-INCH, F:1.7 REFLECTOR. This size mirror takes full advantage of the greater acceptance angle of the new F:1.8, 1.7 and 1.5 objective lenses. This Strong reflector, when used in conjunction with one of these high-speed lenses, will produce approximately 15 to 18% more lumens on the screen *at the same arc current* used with the 16½-inch reflector.

IMPORTANT: this light gain will *not* be realized unless it is used in a projector which is *properly cleared* for the F:1.7 light beam.

Heat Dissipation Vital

2. IMPROVED HEAT FILTER. The dichroic heat filter is mounted in a holder which slides into a cast-aluminum housing which directs a stream of cooling air over the filter glass from a blower having a capacity of 100 cu. ft./min., operated from the D. C. arc supply voltage. Thus is insured a steady flow of air at all times that the lamp is operating.

This filter removes 35% of the total *energy* at the aperture, while resulting in a *visible* light loss of only 8%. This filter will be standard equipment on all 18-inch reflector lamps because we feel that its use is mandatory (at least with black-and-white film) in view of the high efficiency of the improved Strong "135" optical system and notwithstanding the fact that the projector may have a water-cooled gate and, possibly, a pulsing jet of air to stabilize the position of the film in the aperture.

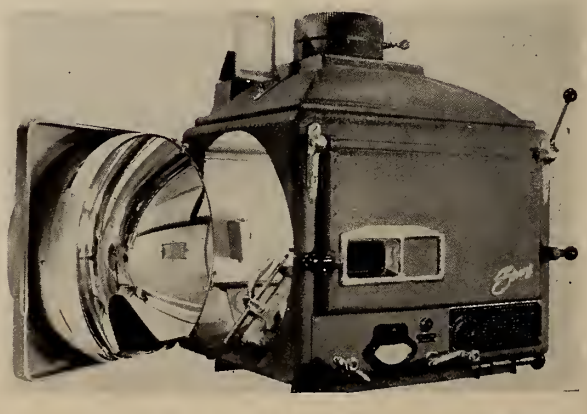
3. IMPROVED REFLECTOR COOLING AND "PURGING" OF THE FRONT SURFACE. The 18-inch reflector lamp incorporates means for cooling the rear surface of the mirror by admitting air through an opening in the rear lamphouse door, this air being drawn in by action by the lamphouse stack exhaust fan which is part of the theatre exhaust duct system. This air is so distributed and directed as to pass over the rear of the reflector, thereby reducing its temperature to a point where heat differentials as a breakage factor are negligible. Recommended exhaust stack volume of air is at least 150 cu. ft./min. from *each* lamp.

To further "purge" and keep the front surface of the reflector free from the products of combustion, two small nozzles supplied with air *under pressure* from the base of the lamp direct a stream of air *upward* and *over* the surface of the reflector. This air is supplied by blowers on the two carbon-feed motors, and this additional method of "purging" is used in conjunction with the same jet of air that is directed over the arc to chop off the tail-flame and which was used on all 16½-inch reflector lamps made to date.

Carbon Contacts; Flexibility

4. NEW-STYLE POSITIVE CONTACTS. These feature a new type of current lead to the upper contact and will insure a life-span equal to that which should be expected from solid pure silver contacts. Another feature is that the upper contact is readily removable from its tension rods for inspection and cleaning. These contacts are cooled by air supplied from the burner base reservoir.

5. FLEXIBILITY. The 18-inch reflector lamp offers extreme flexibility



The Strong Super 135 arclamp which boasts many improvements over its predecessor model, including an 18-inch, F:1.7 reflector, new long-life carbon contact, advanced cooling means and other noteworthy advances.

of interchange of burner parts so that either 9-, 10-, or 11-mm regular, or 10-mm Hitex carbons can be burned effectively. Also, the improved 16½-inch reflector lamps may be converted at any time to use the 18-inch reflector—an advantage not offered by any 16½-inch reflector lamp manufactured up to the present time.

Thus the highlights of the improved Strong "135" arclamp. A detailed description of the automatic positive carbon crater positioning system follows immediately, as a general response to numerous requests from projectionists for data thereon.

Strong's 'Lightronic' Arc-Gap Control

Here in word and illustration is a detailed description of a unit which contributes much toward the solution of a most important and long-standing projection problem.

IT IS fitting that the same group of men who developed the automatic carbon-feed control motor for projection lamps should develop a system for automatically regulating the position of the positive carbon in relation to the lamphouse optical system. The automatic feed control at least partially freed the projectionist from being shackled to the arc in the days when operating was relatively simple as compared with today.

Projectionists now must divide their attention not only to the burning arc but also to reel sequence, threading, sound, rewind, operation of the curtains by remote control, picture focus, and other details. The need for an automatic crater positioning system stemmed from the constantly-increased burning rate of the positive carbon as requirements for screen brightness have increased.

Back in the days of low-intensity arcs, the positive carbon had a burning rate of, roughly, 4 inches an hour, and the angle of convergence, or optical speed, of the light path between lamphouse and aperture was low. Today, with carbon burning rates of 18 to 30 or more inches an hour, and efficient high-speed optical systems, a variation in the burning rate of as little as 2 to 3% can in 20 minutes change the position of the positive crater in relation to lamphouse optical system as much as ¼ inch and result in undesirable color patches on the screen.

Crater Positioning Tolerance

Tests prove that the greatest amount of error that can be tolerated in the position of the positive crater in relation to the lamphouse optical system is under 1/32 inch. Exceeding this limit results in loss of illumination and change of color of the light on the screen to either blue or brown.

It is impossible to maintain the carbon position within this close tolerance without automatic means, unless the projectionist devotes his entire time to supervising this essential detail during projection. Consequently, theatres using carbons with these higher burning rates encounter color change at the screen to a degree inverse to the amount of attention the projectionist possibly can give this detail.

The Strong automatic crater positioning system controls the entire burning of the arc—both positive and negative carbons—even though the burning rate of the positive carbon at a given amperage may vary as much as *plus* or *minus* 8% of the normal value. Not only is a steady light of constant color-temperature maintained throughout the reel, but this automatic system insures that the quality of the light is *exact for both machines at all times* so that the audience will not be aware of changeovers. Any difference in light color-temperature is particularly noticeable when the incoming machine differs in a substantial respect from the outgoing machine in the quality of the light.

Unvarying Color Temperature

In the last few years projectionists and exhibitors have shown a great awareness of the importance of *correct and constant* color-temperature of the light on the screen. One of the tests for such constancy in illumination has been the new Cinerama projection technique. The light sources for the three projectors must be maintained absolutely constant in color-temperature and equally brilliant at all times during the 50-minute projection period so that the illusion of one continuous picture across the screen be preserved. To do this without an automatic crater positioning system would be utterly impossible.

In the last several years Strong-built lamps of the rotating-positive carbon type have incorporated an automatic carbon-positioning system. This system had to be the essence of simplicity, both from the standpoint of minimum maintenance cost and of being consistent with the smallest number of operating parts that can be used, so that possibility of failure be reduced drastically, if not eliminated. All contact-making devices are of the highest quality, completely enclosed and hermetically sealed so that dust and oxidation cannot affect their operation.

Since there is a particularly large amount of energy available in the carbon arc, it is not necessary to construct a super-sensitive detection device to pick up small amounts of energy and amplify them into useful quantities.

Simple Control Required

Since the source of energy being dissipated is measured in terms of kilowatts, it is only necessary to sample a small fraction of this energy to detect an error of position and directly utilize it to actuate the controls of the driving motors which feed the carbons. The control system further required that parts be easily interchangeable—particularly the electrical parts, such as contactors, relays, resistors, motors and optical elements. Simplicity of the current-adjusting control was also a requisite. It consists of a single control so that the projectionist will have the utmost degree of flexibility and ease in adjusting his lamp operation to meet any set of operating conditions.

Furthermore, a good carbon-positioning system should not be sensitive to the diameter of a carbon, the brightness of the burning arc, nor to the current intensity being fed to the arc, but rather only by the position of the gas-ball in relation to the optical system.

Because in a normal burning arc the position of the positive carbon crater in reference to the negative is determined by factors of voltage, current and arc-gap resistance, it will

(Continued on page 26)

In The

SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

POSSIBLE expansion of employment opportunities for members of the organized craft—projectionists, stagehands, and others — is pointed up by the aggressive promotional efforts now being expended by at least three organizations on behalf of a portable Tv projector, as follows: General Precision Laboratory, The Fleetwood Corp., and Philips, of Holland. These systems all produce a 9 x 12-foot screen image which may be picked up from either closed circuit or broadcast-Tv. Moreover, all of them feature extreme ease of operation, servicing, and portability.

IP's interest in these various units centers upon the possibility of the sponsors thereof utilizing the talents of the organized craft, which has demonstrated its ability to operate any piece of equipment designed for visual-aural reproduction.

Under prevailing conditions the expenditure of an additional $2500 for such equipment by any theatre, large or small, is extremely doubtful, considering the more immediate demand to put existing plants in order—new projectors, lenses, light sources, screens, power supply, and the like.

Additional emphasis is lent to this point by the vigorous campaign being waged by the sponsors of these equipments to place the units in convention halls, clubrooms, hotels, and sundry places of assemblage other than theatres. We may accept or reject the assertion by the portable Tv manufacturers that the extreme portability of such units will enable "bicycing" them between the theatre and the aforementioned assembly points.

Whatever may be the ultimate application of these units, these words are intended to alert the craft to be on the lookout for the installation of such equipment in their respective areas.

Such technical details relating to these units as are presently available are detailed on page 28 of this issue, together with the names and addresses of the distributors.

The IA is reportedly investing much time and effort to gaining jurisdiction over such closed-circuit Tv showings. Equipment now is handled by local Tv servicemen, hotel electricians, etc., with house porters doing the pulling-hauling chore. IA slant is that it doesn't care who *services* such units provided IA men operate, set up, and knock down the equipment—meaning projectionists and stagehands.

• More than 130 delegates to the recent California District Council No. 2 meeting visited Paramount's West Coast Studios where they witnessed a special demonstration of VistaVision. The demonstration films included identical scenes photographed with a standard *vs.* the VistaVision horizontal camera, in addition to comparison scenes projected from the regular vertical release print *vs.* the double-frame horizontal release print.

Edward Maule, chief projectionist at Paramount, welcomed the delegates on behalf of the studio. Loren Ryder, head of engineering and recording for Paramount, addressed the delegates and explained briefly the highlights of the VistaVision process.

• From the Women's Trade Union Auxiliary of IA projectionist Local 143, St. Louis, Mo., comes a request that IP publicize the extreme desirability of a women's auxiliary in all branches of the organized craft. In a supporting statement under the heading of "Ten Reasons Why You Should Join An Auxiliary to Your Husband's Union," are listed 10 persuasive reasons why such auxiliaries are extremely beneficial.

All those who view such a move with favor may obtain details by addressing Mrs. Josephine Briley, 9501 Eucalyptus Drive, Afton 23, Mo. Mrs. Briley is secretary of the Women's Trade Union Auxiliary of St. Louis Local 143.

• Irving Griebler, member of Baltimore Local 181, recently completed an assignment for the Wyeth Labs., world-famous pharmaceutical organization, in which he ran off the film

CALIFORNIA DISTRICT COUNCIL DELEGATES AT SPECIAL VISTAVISION DEMONSTRATION



"Management of Streptococcal Infection and Its Complications" before a closed-circuit Tv audience. The telecast was made over 58 Tv outlets before 20,000 physicians. The outlet was the Sheraton-Belvedere Hotel where the film was shown to the members of the Maryland Chapter of the American Academy of General Practice.

● The recent signing of a new three-year contract by Minneapolis Local 219 brought to an end the long drawn-out and often heated negotiations between the Local and the independent owners of five drive-in theatres. The new contract provides for wage status quo the first year, 5c an hour pay increase the second year, and an additional 5c per hour boost the third year.

Separate three-year contracts were signed with the Minnesota Amusement Co. and RKO Theatres, providing for no pay increase the first year, 9c per hour increase each of the following two years. Pacts signed with about 40 independent neighborhood houses also calls for no pay boost the first year, but provides for a pay increase of 8c per hour for 1956 and 1957.

William Donnelly, IA representative, assisted Local 219 officials in the negotiations.

● A gala Easter party, sponsored by the Movie Social Club of Kings County, N. Y., comprised of Local 306 members, was held on April 7 at the Home of St. Giles the Cripple, a non-sectarian hospital for underprivileged children. Such activities are standard Club procedure. Harry Garfman, Brooklyn and Queens business representative for Local 306, is in charge of arrangements for all such affairs.

● IP's office is graced by the presence of visitors from all over the world; but when writing to us upon their return to their natural habitats they never deride the splendid climate of New York City—that is, with the exception of our fellows from California. Witness the following note from our very good friend Frank McBrien, one of those Local 165 persons who exercises his undoubted talents in the projection department



Gold wrist watches were presented to President Herman Gelber (left) and Secretary Ernie Lang (right), New York Local 306, at a recent dinner given in their honor by members of the Local. Each watch is inscribed "For Faithful Service to Local 306." IA President Richard F. Walsh made the presentations.

at the M-G-M studios in Culver City, Calif.:

"I had a pleasant trip home, making very fast time from New York via plane. I must confess that I was glad to get away from your cold weather."

When Frank was here in the office and we cut up a few touches about projection techniques, did we ever mention that we do not have the California smog to contend with and that we *never* had resort to the use of smudge pots to salvage our local crops.

● Woodrow Wilson, business representative for Local 266, Jamestown, N. Y., advises that wage negotiations have been completed with Pic 17 Drive-In Theatre which resulted in a 10% wage increase plus one-hour hour warm-up period and time-and-one-half for overtime. The two-men-per-shift operation in all theatres within the Local's jurisdiction has been maintained.

Participating in the negotiations for Local 266 were Marshall Peterson, president; Ralph Turner, secretary, and Wilson.

● The New York State Association of Motion Picture Projectionists will hold its annual Spring meeting on Tuesday May 10, at Carmen's Hall, 563 Clinton Avenue, Albany. The session will open at two o'clock, following which there will be a buffet lunch at 6 p.m. The Association delegates will be the guests of Albany Local 324 at a midnight banquet, at which there will be entertainment and dancing.

● IA Cameramen's Local 644 of New York City is justifiably proud of the Academy Award to member Boris Kaufman for the best black-and-white photography in the production of "On the Waterfront." Full page ads in the trade papers proclaim that this award-winning picture was "made completely in the New York metropolitan area, with an entire camera crew from IA Local 644." Added line: "and other technical craft unions of New York.

● Department of why didn't somebody think of the idea sooner: a projectionist, writing in *Ideal Kinema* (London, England), refers to the number of "benefit" shows in which all the theatre crafts participate at no cost to the sponsors. One or two such shows a year in a given area, proceeds to go to craft welfare funds, are strictly in order, he suggests. Pointed reference is made to such shows being held for actors and musicians.

● Daniel W. Tracy, 68, president of the IBEW and member of the AF of L executive council, collapsed in the lobby of the Sheraton-Park Hotel, Washington, D. C., where he lived, and died shortly afterward.

IA ELECTIONS

LOCAL 162, SAN FRANCISCO, CALIF.

Al B. Cohn, *pres.;* Paul G. Zern, *vice-pres.;* William H. Lingle, *sec.-treas.;* Lawrence H. Weaverling, *bus. rep.;* P. G. Zern, Henry Meyer, James T. Luther, Sr., Samuel L. Johnson, Anthony J. Rondoni, *exec. board;* Neal J. Salemi, *sgt.-at-arms.*

INTERNATIONAL PROJECTION SOCIETY TORONTO CHAPTER (LOCAL 173)

H. N. "Doc" Elliott, *pres.;* Bill Hills, *vice-pres.;* John Jeffrey, *sec.;* Bob Milligan, *treas.;* Lou Lodge, A. Milligan, P. Cox, F. Cross, Jr., G. Hulse, G. Rands, H. Brooks, and M. Killem, *technical advisors.*

LOCAL 433, ROCK ISLAND, ILL.

Edward A. Short, *pres.;* Richard T. Murphy, *vice-pres.;* George A. Stoddard, *rec.-sec.;* Frederick R. Mauck, *fin.-sec.;* Lloyd Burrs, *treas.;* Fred R. Parker, *bus.-rep.;* Albert B. Adams, *sgt.-at-arms;* Roy L. Blubaugh, Kenneth L. Benedict, Paul E. Short, *trustees;* E. Short, R. Murphy, G. Stoddard, F. Mauck, and F. Parker, *exec.-board.* Messrs. Stoddard, Parker and K. L. Horton, *del., to Tri-City Federation of Labor;* K .Benedict, *del., Iowa State Federation of Labor;* G. Stoddard, *del.,* Illinois *State Federation of Labor.*

BUY SAVINGS BONDS

Tips on Filament Projection Lamps

The projectionist craft is finding ever-expanding employment opportunities at non-theatrical showings of motion pictures—industrial, educational, civic, religious and club dates. Many such showings utilize filament-lamp projectors, hence the appended notes on these lamps as supplied by Sylvania Electric Products.

PROJECTION lamps are designed to give maximum light output from the smallest, most precise source possible. It is extremely important in the design of projectors or other optical devices to obtain the ultimate in these requirements without sacrificing lamp life or presenting replacement problems.

Fundamentally, all filaments used in projection lamps are the same. Since concentration of light is so essential, tightly-wound coils of tungsten wire are used. These coils of wire are then formed into either one or two planes or further wound into coiled forms.

Monoplane, Biplane Filaments

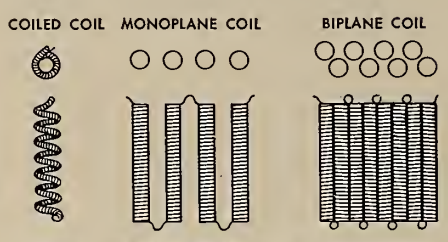
Every projection system ultimately requires as solid a mass of light as is possible. Lamps with monoplane filaments have spacing between the coils for insulation purposes. In use, one side of the flat plane of the filament faces the condenser, while the other plane faces the reflector.

The reflector is designed to refocus the filament image on the same plane as the filament itself, to fill in the spacing between the coils. This results in a near flat plane of light that is collected by the condenser and focused fairly close to the film gate to give the optical system high efficiency.

Biplane filaments consist of two planes of coils. One plane fills in the insulation spacing between the second row of coils to give an even greater concentration of light than the monoplane types of filaments. This design permits even closer focusing of the light source to the film gate, for greater efficiencies. All Sylvania biplane filament projection lamps are mechanically formed in special jigs so that each design can be accurately reproduced.

High-Quality Glass Envelopes

Most projection lamps today have striation-free glass on only *one* side of the envelope. In fact, government specifications for most projection lamps only require one side of the glass envelope to be free of striations and defects. Sylvania lamps, however, are made of carefully selected glass envelopes that are free of scratches, deformed glass and striations on *both* sides of the filament plane. This insures more uniform light distribution throughout the optical system.



TYPES OF FILAMENT LAMP COILS

Projector Design Requisites

All projectors are designed around certain types of filaments and lamp wattages. Naturally, when these are selected the optical system is designed for maximum performance. The use of increased wattage lamps will only appreciably increase the screen lumens until the filament size equals the limiting dimensions of the optical system. After that point the light losses are great and problems are encountered in dissipating the heat from the lamp, film and optical components.

High Efficiency Throughout Life

Since projection lamps are the highest efficiency filamentary types of lamps made for continuous burning, it is important that special techniques be used in their construction to guarantee satisfactory performance over their full life. Pressure filling in some of the higher wattage lamps is used to give *higher* efficiencies, longer life and to reduce bulb blackening. More important are some of the other exclusive features in Sylvania Projection Lamps that serve to maintain the filament in its proper focus position over its full life.

Here are some questions and answers relating to the structure and operation of these 16-mm projection lamps:

Are They Good for Color Projection?

Yes, Sylvania projection lamps are specially designed to produce the best possible rendition of color slides and movies. Each projection lamp filament emits "white" light containing all the colors in the spectrum so that the colors captured in slides and movies will appear on the screen with maximum fidelity.

Can I Use Larger Lamps In My Projector?

No. Lamps larger than those the projector was originally equipped with or larger than those recommended by the manufacturer may do irreparable harm to the machine and film. The cooling systems of projectors are designed for specific lamp sizes, and the heat generated by lamps too large for the system to handle may damage the optical system and injure the film.

Is It Possible To Insert The Lamp Incorrectly?

No. Good projection lamp bases are so designed that they will fit the socket only in the correct position. The lamp will slip into proper position immediately, as long as it is not jammed or forced in. Sylvania bases also seat home firmly in the socket, assuring positive contact even during excessive machine vibration.

How Long Will They Last?

Projection lamps are known as "high efficiency" lamps in the industry. This means simply that they are constructed to utilize their complete wattage so as to provide maximum brightness. Filaments of the lamps burn at white-hot

Test Your Electrical I. Q.

Here again we present a series of questions bearing on your electrical I.Q. Answer these questions, and then see how your answers compare with those on page 23.

(1) What are the regulations for wiring footlight circuits in a theatre as to size of wire, the number of lamps, junction boxes and outlets?

(2) What is the minimum size of wire that may be used for branch lighting circuits, and what is the maximum wattage permitted per branch circuit?

(3) What is an auto-transformer and where is it used?

(4) What is a volt, an ampere, an ohm and a watt? How many watts are there in one horsepower? How many kilowatts equal one horsepower?

(5) How would you change the connections to a three-phase motor in order to reverse its rotation?

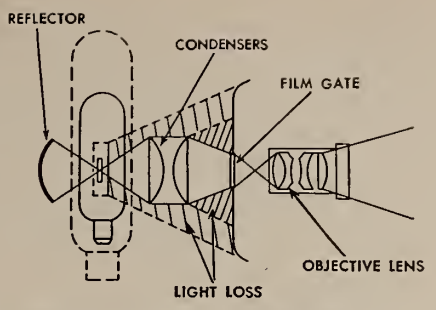
(6) What would happen if a properly fused three-phase motor blew a fuse while running?

temperatures in order to achieve full brilliance. consequently their life is considerably shorter than that of ordinary household lamps.

In spite of these "high efficiency" requirements. Sylvania projection lamps last longer—from 10 hours for 1000-watt lamps up to 100 hours for the 110-watt lamps.

Why Do Some Lamps Have Black Tops?

Tremendous amounts of light are developed by the higher wattage lamps to achieve full brilliance for large size screens. The black caps on these lamps absorb excess light that would otherwise radiate throughout darkened rooms from the machine's ventilating system, interferring with viewer's vision.



LIGHT LOSS WITH OVERSIZED LAMP

Shutter Blade Width & Image Flicker

The question of flicker in the projected screen image and its direct relationship to shutter blade width and illumination level has been discussed frequently in these columns—yet it constantly keeps cropping up. Here it is again.

By ALLAN P. MULCAHY
Rossland, B. C., Canada

A brother projectionist who has been in the craft ever so many years longer than I abides by a cardinal rule that as one increases the illumination one should increase the width of the master (and flicker) shutter blade in order to eliminate flicker.

Originally he had a set-up of Simplex Regular heads with 90-degree rear shutters and Peerless low-intensity (L-I) lamps. He asserts that when he replaced his lamps with Peerless Magnarcs he had to make the blades about 109 degrees in order to eliminate flicker.

His theory would be that since the amount of light is greater with H-I light than with L-I, then the period of darkness during the pull-down should be longer to suppress flicker.

Shutter Cut-off Period

It seems to me that the period of darkness should be as short as possible irrespective of any illumination level so that "persistence of vision" would more readily lend itself to the impression of illumination during the time the shutter is closed. I can see, however, that with larger lamps and larger mirrors the shutter has to cut a greater "disc" of light, thus making necessary increased shutter blades, or else moving the shutter as close to the aperture as possible, as on the Simplex X-L head.

EDITOR'S REPLY: Even though the increase in light transmission is too small to be perceptible, many projectionists trim their shutter blades down beyond the theoretical limit. A shutter excessively trimmed reveals travel-ghost on the screen. Travel-ghost, however, is much fainter than the brightest areas in the picture, hence it is not seen by the average theatre patron if screen illumination be kept below a certain limital value.

When a change is made in lamp equipment to increase illumination, the travel-ghost which previously was practically invisible suddenly shows up. As a result, the shutter blades have to be widened. This is exactly what has been done in this case. Several projector manufacturers furnish two types of shutter: one with blades of normal width for high-level screen brightness, and another having excessively trimmed blades for drive-ins and other theatres where adequate screen illumination is difficult to obtain. Still other manufacturers make their shutters with adjustable-width blades.

Screen Brightness Factor

If intermittent pull-down and cut-off of the light by the shutter were *truly* instantaneous, shutters for use with standard 3/1 Geneva intermittents should have 90-degree blades to mask all travel-ghost. Although the action of shutter and intermittent sprocket is *not* instantaneous, no harm is done by 90-degree shutter blades if screen light be not too bright.

The width of the blades is determined by such factors as size and rotational speed of the shutter, its distance from the aperture, and the diameter of the light beam where cut off by the shutter. Since the last-named factor is governed by the lamp equipment, no definite rules anent blade width can be given.

It is best to have the blades a trifle wider than is absolutely necessary in order to "kill" travel-ghost, rather than *a bit* too narrow. The amount of light gained or lost in this case is insignificant. A 3% increase of light is much too small to be seen by anyone; yet many propectionists trim their blades by 5 degrees to get this slight amount of extra light and run the risk of spoiling the clarity and steadiness of their pictures.

'Reasonable' Trimming

Even when the blades aren't trimmed down enough to cause a definite "ghost," an annoying trembling of bright objects in the picture may be introduced. This is why we advocate shutter blades that are wide enough to conceal *all* motion of the film.

If one blade of the shutter be a little wider or narrower than the other, a terrible flicker will be produced. Otherwise, the width of the blades, within reason, has no perceptible effect on flicker.

BOOK REVIEW

KINOTEKNIK, *by Max Scharnberg. Third revised edition, 580 pages. Published by Jul. Forlag, Copenhagen, Denmark.*

This edition is an important contribution to the technical literature; it is regrettable that it is written in Danish and thus is available to only a limited number of projectionists. The history of projection is accorded a remarkably complete treatment in *Kinoteknik*, as are also the optical, electrical, and acoustical principles involved in the projectionist's art.

The bulk of this comprehensive textbook, however, is devoted to practical instruction in 35- and 16-mm sound projection. Equipment commonly used in Denmark is described in detail.

Famous Projector Names Missing

Among the theatre projectors illustrated we find the Kalee, Aga-Baltic, Askania, Bauer, Bofa, Gaumont-Kalee, Philips, Westar (Century-Westrex), and Zeiss-Ikon (Ernemann). But we looked in vain for our old reliable friends, the Simplex, Motiograph, and Brenkert of world-wide fame and favor! On the other hand, American textbooks of projection make no mention of well-known European machines. Among the many technical credits in the book, we note with a glow of pride, the inclusion of IP in many instances.

Herr Scharnberg's treatment of projection (including color movies, theatre-Tv, 3-D, wide-screen, and CinemaScope) is comprehensive, concise, systematic, and down-to-earth. Only the language-barrier is to be regretted in this valuable source book.

The Ole Crank-Twister

Subject: Linearity

Embedded in this literary fol-de-rol is a very practical projection suggestion. This is tom-foolery in earnest.

PROJECTIONISTS is just like people. After they bin doin a fixed routeen for a long time they just gets linear—a fancy way of sayin that they forget to change when the routeen gets changed.

Take Pete Hackleback, fer instince. Pete is my pardner and works the No. 2 machine—under my close supervision, of course. This old crank-twister is CHIEF! at the Carousel Theatre where projectin pictures takes its proper place. We figger that our job is up on a pinnical and just as important as all the actin and producin and ballywhoin that goes into a movie. Anyhow, the projectin booth at the Carousel is bolted to the rafters of the roof—and nobody can get at us after we pull the rope ladder.

Only 50 Years at Craft

No doubt about it, Pete is a good man on the job but he aint been in the game so long. The ole crank-twister distinkly remembers breakin him in about the time of "The Great Train Robbery," so with his limited expereence he has a lot to learn about projectin.

Little while back he was runnin a premeer showin in Cinemascoper with the big markee sign announcin "The Ole Crank-Twister now operatin." Natchur-the big markee sign announcin "The Ole pressin mob the scalpers hawkin standin room tickets was as busy as the dips who was dippin hip pockets.

Seein is Believin

Everything runnin as per usual up in the booth except that the Ole Twister with his unerrin mind decides to check up on his pardner. Youd never guess what. Here Pete has Part 7 all set to go but has skipped the X-L magnetic head. This gets us back to the subject of forgettin—which is what we wanted

(Continued on next page)

The New Victor "1600" Portable Arclamp Projector

AN extremely portable 16-mm projector and arclamp combination designed to provide professional results for showing of industrial, religious and similar types of non-theatrical films, is available from Victor Animatograph Corp., Davenport, Iowa.

Three-unit portability is an important feature of the Victor "1600" arc projector. First, the rectifier serves as a base for the complete unit. The second unit is a lamphouse. The bass-reflex speaker in the third unit serves as a carrying case for projector head, amplifier, reel arms, power cords, extra carbons and takeup reel. The parts contained in the three units can be set up for operation within 5 minutes. Total weight of all three units is 207 pounds.

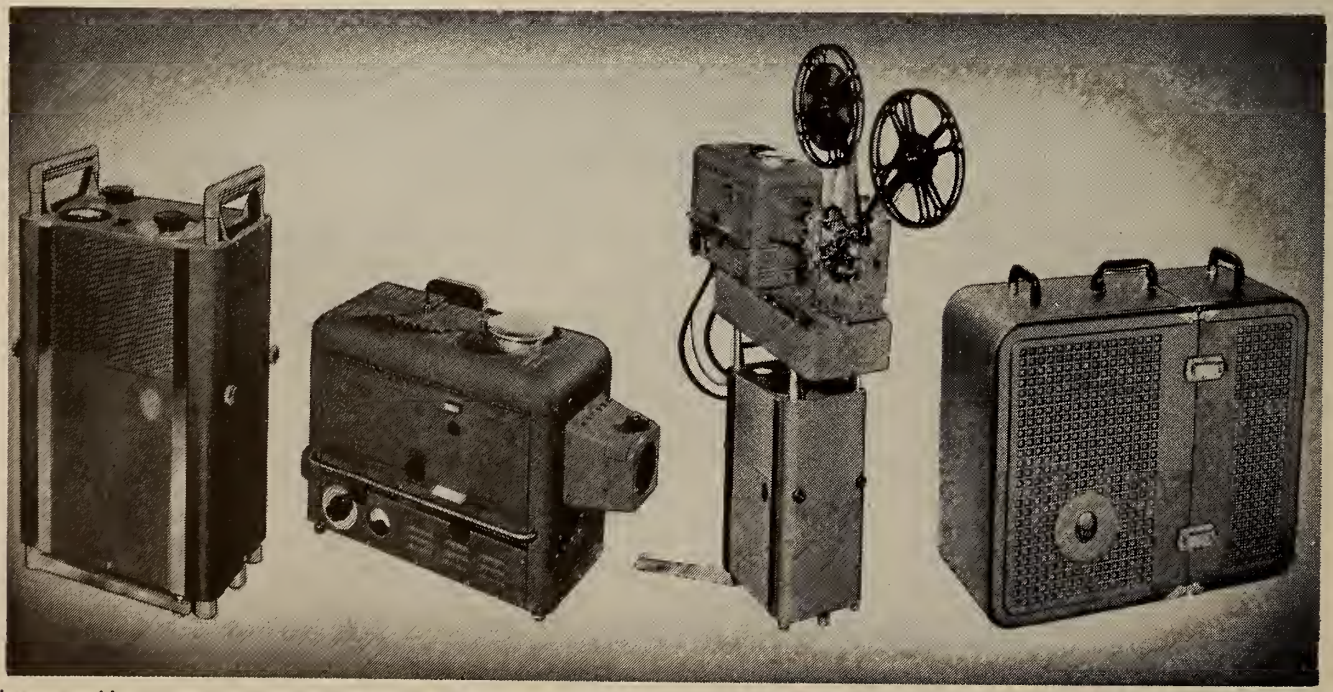
The combination rectifier and base has stabilizing swing-out legs with built-in floor levelers for quick and easy setup on uneven floors. Blower cooling is used to insure longer rectifier life. A positive lock-tilt assures fast, accurate picture centering on the screen from any angle or throw, vertically or horizontally.

Delivers 1600 Lumens to Screen

The source of illumination for the Victor 1600 is a self-contained portable arclamp which, though small in size, delivers 1600 lumens to the screen over a full hour show period and uses only one carbon trim pulling 30 amps. This arclamp is easily attached to the amplifier unit by means of a finger-tip, snap-lock catch. The lamp has a built-in ammeter enabling a quick check on operation.

The amplifier itself has convenient top-mounted controls. Arranged on the control panel are an amplifier "on-off" switch, a 3-amp fuse, separate exciter lamp switch, individual tone and volume controls, phone input and volume control.

More complete data on this unit is available from Victor Animatograph Co., Davenport, Iowa.



Three portoble units that can be quickly ossembled to set up the Victor "1600" Arclamp projector, along with o view of the ossembled projector ready for oction. At the left is the combination rectifier ond base. Next to it is the portoble orclamp. The boss reflex speaker shown at the right also serves as a carrying cose for the projector heod, omplifier ond other ports. The ossembled projector is shown second from the right. Note the position of the amplifier unit which is removed from the speoker cose and positioned between the rectifier base ond the arclomp ond projector mechonism. These units hove undergone severe field tests prior to being offered on the morket.

to holler about in the first place.

Well, instead of preachin to Pete—which dont never do no good—the Ole Twister decides then and there to do sumthin different.

You know them equalizin drums in the X-L magnetic head is black as a widow spider in a coal bin. You cant see em turn. So Ole Twister gets the bright idee to paint half of the edge of each drum white. Now after you cut a projector the white spots keep awhirlin around in front of your nose for a good 4 minutes. With that goin on how can you ferget?

If Pete ever again fergets an skips the magnetic head he aint dumb but just stupid, and the Ole Twister is gonna apply a crank handle right across the place his brains shouldnt be. Pete is some charicter. When I was writin this little sermin he was lookin over my shoulder. Told me I was spellin the word "linear" wrong. Just to please him I spelled it his way.

FRANK W. MACDONALD
IA Local 199, Detroit, Michigan

Electrical Exam Answers

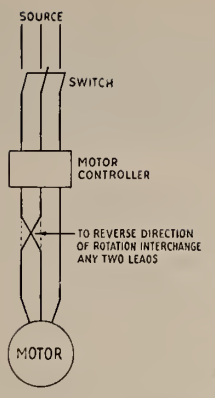
Here are answers to the electrical licensing examination questions posed on page 20.

(1) Footlights must be wired with at least No. 14 B & S gauge double-braided, rubber-covered wire. No more than 1320 watts or 32 receptacles to be dependent upon a final cut-out. Receptacles must be enclosed within approved boxes as must junction boxes of an approved type, properly enclosed and readily accessible for inspection.

(2) The minimum size of wire for branch lighting circuits is No. 14, the maximum wattage permitted per branch being 1650.

(3) An auto-transformer is a type of transformer in which one winding serves for *both* primary and secondary. Auto-transformers are used where the ratio of transformation is small, as in A.C. motor starters and in certain other applications, as a considerable saving in copper and iron can be effected, and the whole transformer reduced in size as compared with one having separate windings. For the secondary circuit, one wire is connected to one end of the coil, and the other to some intermediate point, depending upon the desired ratio of transformation.

(4) A volt is the electromotive force which produces a current of one ampere when steadily applied to a conductor having a resistance of 1 ohm. An ampere is the current which when passed through a solution of nitrate of silver in water. in accordance with certain specifications, deposits silver at the rate of 1.118 milligrams per second. An ohm is the resistance of a column of mercury (at the temperature of melting ice) of uniform cross-section of one square millimeter and a length of 106.3 centimeters. A watt is the power expended by a current of one ampere in a resistance of one ohm. One horsepower equals 746 watts. Since one kilowatt equals 1000 watts, it follows that one kilowatt eqquals 1,000/746 or approximately 1.35 horsepower.



Drawing illustrates how a reversal of rotation may be obtained in an alternating-current motor.

(5) By interchanging any two of its power supply leads, as shown in the accompanying diagram.

(6) It would cause the motor to either run very slowly or stop altogether, depending upon the electrical load. If the motor be equipped with proper overload protection, the functioning of these would automatically disconnect the motor from the line. If, on the other hand, no protective devices be available, the motor would heat up, perhaps sufficiently to cause damage to its windings.

***Questions and answers are presented through the courtesy of Theo. Audel & Co., publisher of Audel's Questions and Answers for Electricians Examinations.**

Motiograph Adds Products

Motiograph, Inc., has developed a new low-cost in-car speaker, its aluminum housing containing a 4-inch diameter speaker unit. This speaker and junction box is known as the Economy Line, which with the Rainmaster Series and the DeLuxe plastic line enables Motiograph to give drive-in theatre owners a wide choice of in-car speaker equipment.

To meet the increased demand for greater screen illumination Motiograph is making its Hi-Power arclamp for 115-ampere operation. Motiograph also has a new line of selenium rectifiers for lamps operating up to 135 amperes; and has added a new 160/320-ampere generator to its line.

New 20th-Fox Process Delayed

Although 20th Century-Fox has plans for a new projection process for road-shows, utilizing oversize prints from oversize negatives, actual use of the process is probably about two years away, it is reported.

Fox has been experimenting with a 65-mm camera and projection process with a straight projection pulldown similar to that used by Todd-AO, but it is reported that Fox found the 65-mm film unsatisfactory for projection because of its tendency to huckle and thus go out of focus. Now experiments are continuing with 55-mm rather than 65-mm prints. Use of this process would not interfere with distribution of 35-mm CinemaScope prints.

All-Purpose Film Process is Foreseen by Technicolor

Working out of an all-purpose motion picture production process, which would start with a large-area camera negative capable of providing prints suitable for a variety of presentation methods should he the technical goal of the film industry at this time, says Herbert T. Kalmus, president of the Technicolor companies.

"We visualize a process," he said, "which starts with an increased negative area of theoretically best area and dimensions which may be printed and rephotographed to yield prints suitable for: (a) large screen special theatre projection; (b) any theatre projecting 35-mm prints with a screen of any size and shape; (c) 16-mm projection, and (d) television." Prints would be made to carry any existing sound system, stereophonic or otherwise.

RKO Theatres 1954 Profits

RKO Theatres' net income in 1954 was $829,920, compared with a loss of $296,570 in 1953. In a report on operations, RKO revealed that in excess of $600,000 was expended during 1954 on new screens, sound equipment, lenses, projectors and other theatre improvements. This compares with an expenditure of $1,500,000 for new equipment in 1953. All RKO theatres now have every facility for projecting films in all new media in general use.

Ryder Hits Equipment Cost

Warning against new projection processes that are too costly for theatre installation was issued by Loren Ryder, chief of Paramount's research and sound department, at a recent meeting of the West Coast section of the SMPTE, held on the Paramount lot.

The only solution to the problem of incompatible aspect ratios and processes is for industry technicians to get together in "honest criticism" of each others' thinking, he said. "Let us compare our work in the laboratories and not at the expense of the theatres and the studios."

LETTERS TO THE EDITOR

Magnetic vs. Optical Sound

To the Editor of IP:

I am convinced that magnetic sound quality is far superior to optical. Contrast the orchestral passages in the film "Garden of Evil" (CinemaScope), wherein the sound fairly lifted one out of one's seat, with those in "Rhapsody" (MGM Perspecta). This latter film had all the opportunities for Hi-Fi musical reproduction, and while it was undoubtedly good, it was miles behind the magnetic four-track job.

Unfortunately, all the local CinemaScope installations are using single-track optical sound, the full stereo-sound installation proving too costly. A pair of anamorphic lenses and a new screen is about $1250. for a small suburban show, which can utilize its existing arclamps.

DAVID BLISS

Townsville, Queensland, Australia

BY THE EDITOR: Much of the enthusiasm for CinemaScope stereophonic magnetic-track *orchestral* recordings is undoubtedly due to the fact that these recordings are *truly* stereophonic. Not so with Perspecta directional tracks, which are physically incapable of splitting up simultaneous sources so as to reproduce the natural effect of an orchestra.

In Perspecta reproduction, the flutes cannot be separated from the violins, if both are playing at the same time at different parts of the screen. The most that Perspecta can do is switch *all* of the sound—all instruments—to one or more of the three sets of speakers.

As regards *fidelity* of reproduction—and here we shall have to compare single-track, non-directional optical sound—the differences are real but misleading.

The writer recalls a theatre in which the non-sync scratch filters were accidentally shunted across the photocells of the soundheads, cutting off the higher frequencies. The audience was delighted by the deep, resonant response, and wondered if new equipment were responsible for the vastly "improved" sound! The sound engineer "blew his top"—not because of the projectionist's oversight but because of the public's stupidity and utter lack of appreciation of full-range reproduction. Hi-fi is not, and never was, the public's cup of tea.

CinemaScope magnetic recording certainly suppresses the higher frequencies of audible sound high-frequency attenuation, however, is pleasing to the average listener. No surface noise—no shrill harmonics—relatively louder bass. Just soothing sound that gently caresses the eardrums.

'Natural' vs. 'Unnatural' Sound

All that, however, is *unnatural* sound. It makes music sound better, but muffles voice harmonics just enough to interfere with intelligibility. It is the kind of sound which is *deliberately* built into commercial radios and phonographs. It is as unnatural as the tinted-base movie film which the public still prefers to clear-base film for black-and-white prints.

Frequency-response tests in optical-sound systems have been a standard tool in the service engineers little black bag for many years. To date, the proponents of CinemaScope magnetic sound have kept suspiciously aloof from down-to-earth field evaluations of the response characteristics of CinemaScope magnetic sound.

And for good reason, apparently. A 10.000-cycle magnetic-track test film simply won't impart the slightest wiggle to the needle of a volume meter in the average theatre outfitted for magnetic reproduction.

We Try to Please

To the Editor of IP:

Just a few words of complaint (and indirectly a boost) about the way some articles are handled in IP. For some time I have kept a file of IP articles that I feel may be of use to me at a later date. But some articles are printed with photos back-to-back or else overlapping in such a manner that it is not possible to cut them out and paste them in a scrapbook without destroying one or the other. Moreover, to save *all* the pages, advertisements included, fills a binder in short order.

Is it possible to eliminate this condition for the aforementioned reasons?

JAMES A. HINDMAN

Rochester, Penna.

[EDITOR'S REPLY: Mr. Hindman's view has been expressed on various occasions by other readers of IP. Unfortunately, the exigencies of publication, particularly in a journal presenting technical data, militatc against adoption of his suggestion, especially if a reasonable degree of continuity is to be realized. It would seem that the simplest procedure would be to use not a pasted-up scrapbook but a looseleaf binder, using the side margin for the punch holes.]

IP Truly International

To the Editor of IP:

Mr. Jean Suquet of Societe Le Carbone-Lorraine, in charge of the Lorraine Orlux carbon manufacturing plant and responsible for the manufacture, production and design of all Lorraine Orlux carbons, has been visiting with me, and we in turn have been visiting with projectionists in the East, Midwest and Southwest areas. His discussions with projectionists have been most instructive.

Mr. Suquet is a Paris, France, subscriber and an ardent reader of your publication. He advised me that the down-to-earth technical articles published in INTERNATIONAL PROJECTIONIST are most easy to read and understand, and are on the "must read" list for his engineers. He also stated that IP is widely read by projection technicians on the Continent.

EDWARD LACHMAN

Carbons, Inc., Boontoon, N. J.

LENS-CLEANING RULES

1. Remove dust. (Blow, brush or wipe off.)
2. Clean with water, detergent solution, or mild soap. Rinse scum-free.
3. Always use dust-free cloths, cotton, or lens tissue.
4. Never use cleaning powders.
5. Silicone-treated cloths, now being widely touted as "cleaning" aids, should never be used on coated lenses.

Post These Rules for Ready Reference

Todd AO Opening Delay

Opening of the film, "Oklahoma" in the Todd-AO process at the Rivoli Theatre in New York City will probably be delayed until as late as July. The delay is due in part to uncertainty over the lease for the theatre which must be renewed within a year. Backers of the Todd AO process are reluctant to make the large investment for installing Todd AO projection equipment until the lease question is settled.

Picture Attendance Is Rising But 'Lost' Audience Remains

Despite gains in box office revenue and attendance during 1954, the exhibition industry should not allow itself to be lulled into the feeling that all is well, informed industry circles feel. The job of recovering the "lost" audience is much more formidable, as is clearly demonstrated by recent figures from the Census Bureau, U. S. Commerce Dept.

The government estimates the population gain from July, 1946, to October 1, 1954, at 15.4%, or from 141,389,000 to 163,211,000. The estimated weekly attendance at motion picture theatres in 1946, the record year for the industry, was 90,000,000, while the attendance figure for 1953 was 50,000,000, and for 1954, 52,000,000.

Examined from this perspective, the 4% gain in attendance between 1953 and 1954 seems quite small. If figures on attendance are considered in relation to population increase, theatres would have to sell tickets to close to 100,000,000 people each week to equal the record set in 1946. This would be almost twice the weekly average for 1954.

AO's New Film Division

American Optical Co., co-partners in the Todd AO wide-film motion picture system, has created a new division to handle the exploitation and commercial application of all its motion picture products. William F. Peck, formerly of the Instrument Division at Buffalo, N. Y., will be general manager.

Kodak 16-mm Pageant Pamphlet

A pamphlet describing the new Kodascope Pageant series of 16-mm sound and silent projectors and their uses under varying conditions of audio-visual operation is now available. The Pageant series includes a wide range of models which make possible the selection by business and other users of equipment exactly tailored to virtually any projection requirement. An exclusive feature is "permanent pre-lubrication," which eliminates over- or under-oiling, the chief cause of projection wear. The pamphlet is available free from Eastman Kodak, Dept. 2, Rochester 4, N. Y.

Huge Film Storage Center

Consolidated Film Industries, of Fort Lee, N. J., has completed a new film storage building capable of accommodating 60,000,000 feet of film under electrically-controlled temperature and humidity conditions. Said to be the only storage center in the U. S. designed for long-term scientific film protection, a constant 72-degree temperature and a 50% relative humidity is maintained.

Lens Showmanship

with SUPER SNAPLITE

f/1.7

Projection Lenses



From Kollmorgen . . .
the newest, fastest
projection lenses you can buy.
To give you the brightest,
clearest, sharpest, most
uniform picture you have ever
seen on your screen.
For better Boxoffice,
for better Showmanship, for better all
around filming, try these new f/1.7
Super Snaplites today.

For more information
ask your Theatre Supply
Dealer or write for Bulletin 222.

You get more Light
with Super Snaplite

KOLLMORGEN Optical CORPORATION

Plant: Northampton, Massachusetts

New York Office: 30 CHURCH ST., NEW YORK 7, N. Y.

'LIGHTRONIC' ARC CONTROL

(Continued from page 17)

readily be seen that to successfully control the position of the positive crater and maintain a stable burning arc it is also necessary to control the position of the negative carbon electrodes in coordination and in conjunction with the positive. For this reason, the ideal system should control not only the positive but the negative carbon as well, and the position of the negative carbon should be such that the arc will burn in a stable manner when the positive is held in its prescribed position in regard to the optical system. The Strong carbon-positioning system embraces all these requirements.

Design of Arc Control

The components that make up the carbon regulating and feeding systems are simple, and include a hermetically-sealed, double-compensated bimetallic element which is sensitive to the radiant energy taken from a portion of the carbon arc in the arc stream and adjacent to the crater face. The optical system which concentrates this energy on the bimetal tube is a single element, in that the condenser is ground on one face of the prism.

The bimetallic switch is arranged so that it directly controls the motor field of the positive and negative motors, which are connected to feed their respective carbons. This control relay shunts out the resistance in one field of one feed motor while at the same time it is releasing this shunt resistor from the control field of the other feed motor; thus, one motor is slowed down and the other speeded up to maintain a constant arc-gap length and still meet the requirements for adjusting the positive carbon either in one direction or the other to maintain it at the correct focal point.

A simple analogy of the manner in which the bimetal tube functions may be gathered from Figs. 1 and 2. The carbon arc is depicted akin to the sun shining through the window and falling upon the right-hand portion of the teeter-totter arrangement. This portion becomes warm, as evidenced by the "thermometer". The control element, as shown by the figure of a man resembling a bimetallic tube, immediately moves to the shaded portion of the sawhorse, causing it to engage the negative carbon drive motor and slow it down. At the same time the positive carbon motor is released so that it will speed up.

This coordinated action has its effect upon the feed of the carbons. The positive carbon is fed slightly faster than it is burning, while the negative carbon is slowed down so that it recedes slightly, thereby shifting the position of the light source as depicted in the right-hand area of the cartoon. This causes the bimetal tube "man" to again feel uncomfortable and to run to the other side of the see-saw. Thereby the positive carbon drive is slowed down and the negative carbon drive released (Fig. 2).

This action of running back and forth analogizes the operation of the tube in the lamphouse which is never in an inoperative position. It is constantly "sensing" slight variations in the position of the positive carbon and shifting the arc ever so slightly one way or the other so that it remains in exact focal relationship with the reflector. This slight shifting is so minute and so continuous that it cannot be detected either by the projectionist in watching the lamphouse closely or by those watching the screen. In fact, the total movement of the positive carbon from the exact focal point of the reflector usually does not vary more than plus-or-minus 6 to 8 thousandths of an inch.

Figure 3 shows the wiring diagram, giving the arrangement of the bimetallic tube as actually incorporated in the control system of the lamphouse. As will be noted, the control relay is so arranged that it will shunt out either one of the two resistors that are in series with the fields of the feed motors. Thereby the negative is slowed down and the positive speeded up, or *vice versa,* in the same manner that the bimetal tube in our cartoon controls the motors in response to the position of the source of energy.

Value Easily Proven

The stability of the Strong control system is easily demonstrated. The arc can be struck, the position of the positive crater deliberately thrown off its intended position to such an extent that there will be no light on the screen, the negative carbon positioned so that there is either an extremely short or long carbon arc-gap length; and without further attention both carbons in several minutes will *automatically* return to the correct arc-gap length, with the relation of the positive carbon to the optical system being returned to its optimum position. The light on the screen will be at maximum and uniform brilliancy.

It should be remembered that the length of the arc-gap or distance

FIGURE 1

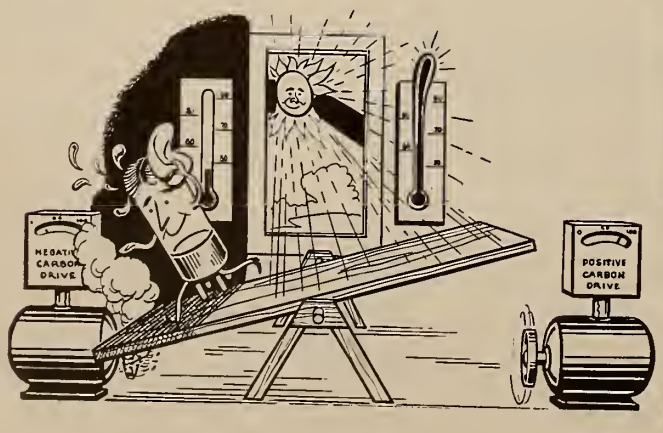
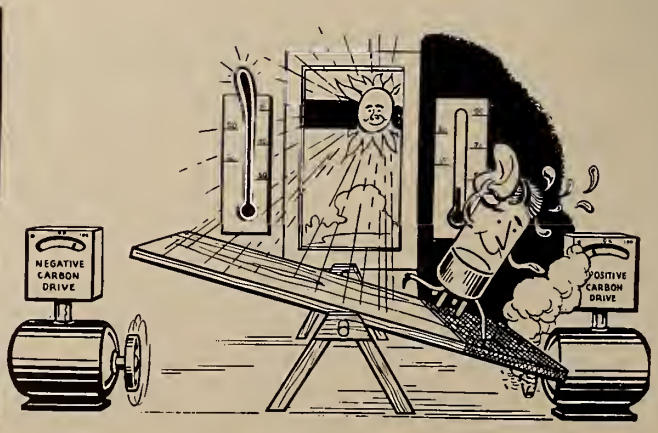


FIGURE 2



between electrodes is governed primarily by arc voltage or the electrical "pressure" between the carbons, which is a resultant of the power that is fed to the arc, consequently the distance between the carbons should be properly regulated by the output of the generator or rectifier. In the case of the rectifier the output is simply regulated by changing taps; in the case of the generator the power output

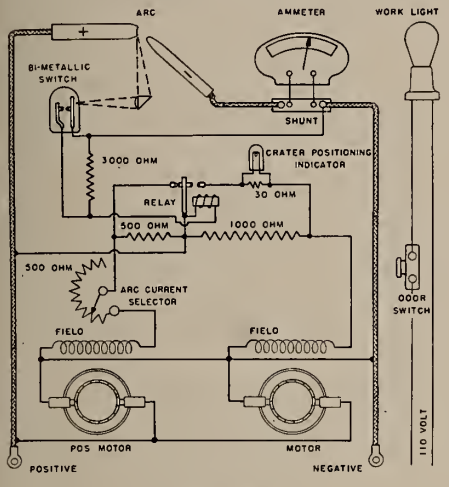


FIGURE 3

is regulated by changing the ballast resistance in the arc power supply circuits between the generator and the lamp.

As the power to the arc is increased, nothing else having been disturbed, the length of the arc-gap will gradually increase. If the power to the arc be decreased, the length of the arc-gap will gradually decrease. Such a change of input power will not cause a change of arc amperage beyond the initial surge at the instant of change. If the lamp be allowed to burn at either increased or decreased power until stability is reached, nothing else having been disturbed, the arc amperage or current will finally settle to the same value as before the change of input power to the lamp was made.

Amperage-Feed Relationship

The amperage at which the lamp will operate and the rate at which the carbons are being fed are two factors which are closely related. The higher the rate of feed that is selected, the higher the arc current will be. The setting of the feed control of this automatic lamp will simply result in a feeding of the carbons *at a certain average rate.*

This rate of dual feeding of the carbons causes the arc current to be

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established at a value so as to effect a *balance* between the rate at which the carbons are being *fed* and the rate at which the carbons are being *burned*. If the rate of feed is speeded up, the carbons will consequently have to be burned off at a faster rate. So in the adjustment of this or any type lamp it should be remembered that the motor or carbon feed rate controls are adjusted simply to attain the desired burning rate or arc amperage, and the power supply is adjusted only to obtain the desired arc-gap length. If the arc-gap be too long, decrease the power supply by lowering the rectifier output.

If a generator or commercial D. C. be in use, *increase* the line ballast by pulling out the switches or disconnecting links so as to increase the voltage-drop across the ballast. If the arc-gap be too short, increase the power supply by raising the rectifier output. If generator or commercial D. C. be in use, *decrease* the line ballast by throwing in additional switches or connecting additional links so as to decrease the voltage-drop across the ballast.

After the correct arc setting is thus obtained as determined by the arc-gap length, no further adjustment of the power supply to this automatic lamp will be necessary—unless as is indicated here:

Possible Adjustment Suggestions

When the crater-positioning indicator light (located on the control panel just above and to the right of the positive manual carbon-feed crank) is "on" it indicates that the positive carbon is being fed at a faster rate than was selected. When this light flashes "off" it indicates that the positive carbon is being fed at a slower rate than was selected.

If the crater-positioning indicator light remains "off" for long periods, or if the arc-gap becomes too short, or the carbons "overfeed," the power to the arc is too low for the burning rate selected and the power supply must be increased.

Conversely, if the crater-positioning indicator light remains "on" for long periods of time or if the arc-gap becomes too long, or if the carbons "underfeed," the power supply to the arc is too high for the burning rate selected and the power must be decreased.

Small, Mobile Tv Unit Gives 9 x 12 Picture

EXHIBITS OF closed-circut Tv apparatus for both theatre and individual use featured the annual show of the Institute of Radio Engineers, recently concluded in New York City. Most complete of the exhibits was General Precision Labs' portable Tv projection unit for use in hotels, meeting halls, and also in small theatres. These new units provide a picture up to 9 by 12 feet, accommodating audiences of about 300 people.

A somewhat similar Tv projector is that of the Fleetwood Corp., Toledo, Ohio. This unit, priced at $2,450, is expected to appeal to small theatres which cannot afford the much higher price of more powerful theatre Tv equipment. Both the GPL and Fleetwood projectors operate from a 40-kilovolt power tube linked to a Schmidt optical system. Each unit is simple to operate and is set on wheels so that it can be moved easily from one location to another.

Optical Systems Differ

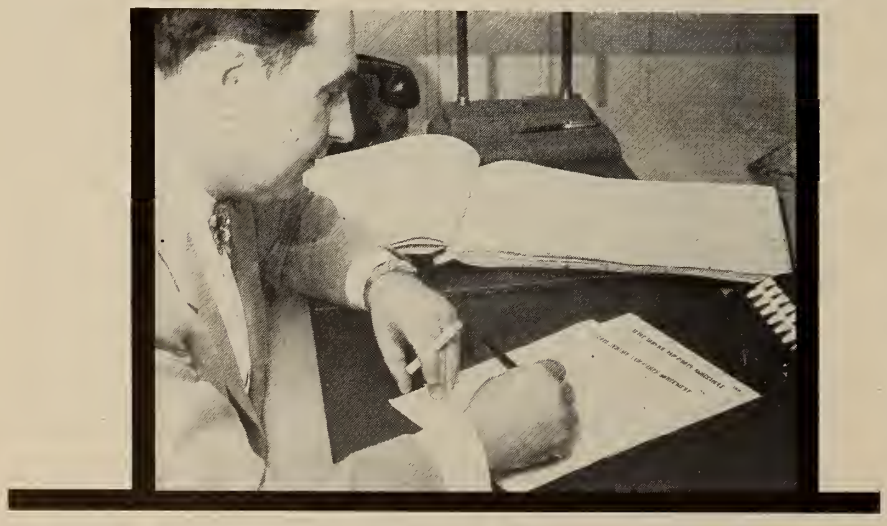
A difference between the two units is in the design and location of the optical systems. GPL locates the projection tube and reflector in a maneuverable projection barrel at the top of the cabinet; the Fleetwood projection tube beam is directed downward into a 14-inch concave circular mirror of Schmidt system. This beam is deflected to the screen by another mirror set at a 45-degree angle at the top of the set. Positioning of the picture on the screen is accomplished by means of knobs located on a control panel in the rear.

The Fleetwood projector contains a built-in speaker for use with small groups and plug-in facilities for driving fixed speakers in larger auditoriums. An audio amplifier and a speaker system is listed as optional equipment for the GPL projector.

Hotels Seen Large Purchasers

Some time ago, Theatre Network Television, which produces closed-circuit Tv shows for both entertainment and industrial purposes, purchased a large number of these GPL projectors for use in hotels. The first multiple-purchase of the Fleetwood equipment was by the Sheraton Hotel chain which ordered 11 for closed-circuit conference hook-ups and other applications.

In addition to its Tv projector, GPL also has available small but versatile Tv cameras adapted to a number of industrial and other closed-circut uses in combination with its Tv projector.



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THE DEVELOPMENT OF THE MOTION PICTURE PROJECTOR

(Continued from page 15)

use and, later, through the Patents Co., participated in royalties collected for their use.

Judge Dickinson said: "Every theatre was required to pay royalties for the use of projection machines, even where the machine had been *owned* before the combination was formed." He overlooked, or ignored, the fact that the machines had been sold *without license or other authority from the owners of the patents!*

Defends the Patents Co.

I maintain that the Patents Co., instead of being an organization in *restraint* of trade (which the Sherman Law was designed to prohibit)was in effect an organization to *facilitate* trade, for the reason that prior to the date of the Patent Co.'s acquiring the right to grant licenses, under all the controlling patents, no producer or exhibitor could do a legitimate business (that is, a business that did not infringe one or more patents); and the fear of running counter to the patent laws certainly has a deterrent effect upon everybody except those piratically inclined.

Many erroneous statements have been made and published as to when and by whom the first motion picture projection machine was made. I have been asked many times to list those basic inventions upon which, in my opinion, the motion picture industry was established —as shown by U. S. Patent Office records. Subsequent to this early experience I was called upon to testify, as an "expert," in litigation under my patents, and later under the Edison and other patents owned by the Patents Co.

Basic Inventions Listed

There have been a great variety of motion picture projectors, produced under different names, that vary as to their mechanical details but embody all the inventions that may be called basic —basic in the sense that they are necessary for successful projection and have been used since the beginning or near the beginning and are still being used. The following is my list of the eight most important inventions in the motion picture art:

(1) The Edison camera: (Patent No. 589,168, dated Aug. 1897; filed Aug. 24, 1891). This was the first camera employing a perforated film which was given an intermittent motion so that a given number of perforations and a given number of pictures would be intermittently moved, rather than *given length of film*. The result was a film having equally-spaced, juxtaposed pictures throughout its length. The first practicable motion picture camera produced.

(2) Edison motion picture film: (Patent reissue No. 12,038, Sept. 30, 1902; filed Aug. 24, 1891). The first perforated motion picture film having equally-spaced, juxtaposed pictures, necessary for acceptable projection and an essential part of every motion picture projector in use the world

(Continued on next page)

Theatre Seating Capacity Now Greater than 1948

Although there has been a decrease in the *number* of operating theatres during the past six years, overall seating capacity of all theatres has actually increased as a result of drive-in construction.

Between March, 1948, and March, 1954, there were 6,280 theatre closings, according to a survey made for the Council of Motion Picture Organizations. However, with the addition of 807 new indoor theatres and 3918 drive-ins during the same period, plus a number of reopenings, the total number of theatres in operation as of last March was 18,351, a net loss of only 56 theatres during the six-year period.

In addition, the number of "seats," including drive-in theatre capacity, has actually increased during the six-year period. A 600-car drive-in, for instance, is considered to have 2,400 seats—four per car. The average per-car seat occupancy of drive-ins is less than this, about 2½, but it must also be considered that the average occupancy of indoor theatre seats over a weekly period is usually less than 50%, if big-city first-run houses are excluded from the count.

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over today. This Edison film, first made some time prior to 1891, was 1⅜-inch wide over all, had four perforations to each picture, being 1 inch wide by ¾ inch high.

(3) The Edison peep-hole Kinetoscope: (Patent No. 493,426, dated March 14, 1893; filed Aug. 1891). This was the first motion picture exhibiting machine employing a perforated film with equally-spaced, juxtaposed pictures. The first practicable motion picture exhibiting machine of *any* kind, *but incapable of projecting pictures successfully* because it gave the film a *continuous* instead of an *intermittent* motion.

(4) The Jenkins and Armat *intermittent* projector: (Patent No. 586,953, dated July 20, 1897; filed Aug. 28, 1895). The first motion picture projector giving the pictures an intermittent motion with *a long period of rest and exposure.* A mechanical failure, it nevertheless demonstrated the necessity and value of long exposure, essential to successful projection.

(5) The Vitascope invented and patented by Thomas Armat: (Patent No. 673,992, dated May 14, 1901; filed February 19, 1896). The first projector machine employing a loop-forming means and embodying a *practicable* intermittent movement giving the pictures the required long period of rest and exposure. A loop-forming means is essential in projection machines employing a long length of film.

(6) The star-wheel intermittent movement invented and patented by Thomas Armat: (Patent No. 578,185, dated March 2, 1897; filed September 25, 1896). By means of this intermittent movement a small sprocket carrying the film could be given a *gradually accelerated* intermittent movement without film wear and tear and without jar to the mechanism. This movement superseded all others by 1897.

(7) The Albert E. Smith framing device: (Patent No. 673,329, dated April 30, 1901; filed March 15, 1900). This device frames the pictures while the machine is running, and is a practically essential device.

(8) The John A. Pross shutter: (Patent No. 722,382, dated March 10, 1903; filed January 19, 1903). An important improvement for reducing scintillation (flicker). Not as essential in 1895-96 when only Edison films were obtainable, since these films were taken at approximately 40 per second, but quite essential wih pictures taken at the later commercial lower rates.

The foregoing is a complete list of the pioneer inventions covering the essentials of the motion picture camera, the film, and the projector—all in universal use today in the most modern equipment. The addition of color and sound accompaniment belong to a later period.

Camera, Projector Differences

For the possible benefit of modern workers in the art, I pointed out some of the differences between a motion picture camera and a projector, from the patent and invention standpoint. These differences were emphasized by me in the U. S. Patent Office interference in which my Vistascope patent, No. 5 on the list, was involved.

I am not an attorney, but my familiarity with the art and its requirements enabled me to conduct this case successfully "on my own" preparing the brief and arguing the case personally before the several tribunals of the Patent Office and the Court of Appeals of the District of Columbia, all of which tribunals accepted my views and decided in my favor.

In taking a picture of an object in motion it is essential to make the exposure of the image on the film as short as possible, consistent with the sensitiveness of the film, because if this be not done, there will be time for the image of the moving object to be displaced on the sensitive film, causing a blurred or indistinct picture.

In the projection process the reverse is true: here a picture is fixed beyond the possibility of any such image movement's causing blur, and the longer the picture is exposed to the eye the better the results.

The Problem of Flicker

With a camera we are dealing with a *moving* object and a sensitive film. With a projector we are dealing with a *fixed* picture and the human eye. No question of flicker enters into the problem of *taking* pictures; but it does enter very extensively into the problem of *exhibiting* pictures.

In a camera, the sensitive film does not cooperate with the mechanism to produce a complete or final result. The film has to be taken out, developed and printed before the operation is complete. The film is run through the camera *but once.* The Patent Office and the law courts held that the film is no more a part of the camera than the paper is of a printing press!

In an exhibition machine the film with pictures on it is an *essential* part of

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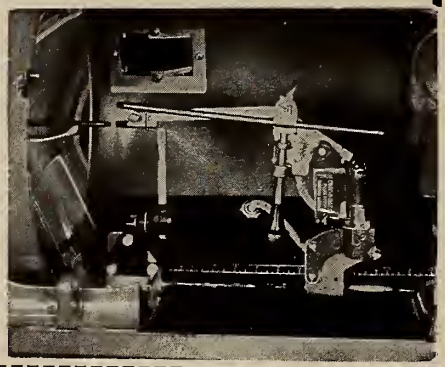
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the apparatus: it is a part of the mechanism which *cooperates* with the other parts to produce the *final results*. In exhibition the film is used over and over again in the projector and has to be so used whenever the film is exhibited. In passing upon this question the U. S. Patent Office had this to say:

"If Latham with his Exhibit Machine No. 12. and Casler with his Exhibit No. 1 Machine. both of which were *.taking* cameras could *without invention* have produced a machine of the construction called for by the issue, it is remarkable that they did not do so at any proven date before the filing of their application.

"The evidence shows that neither Latham nor Casler was an ordinary mechanic but that they were inventors of considerable capacity; yet neither produced a machine having the new and beneficial results which are claimed for the machine described in Armat's application . . .

Intermittent Movement a 'Must'

"In our opinion, proof of the existence of a camera for *taking* pictures of an object in motion, said camera having, in combination with a sensitive film, a mechanism for giving the film an *intermittent* motion in which the periods of pause exceed the period of motion; said mechanism comprising, in addition, the other elements called for by this issue and a shutter, is not a *reduction to practice* unless there is proof to show that when this camera was used for projecting, the shutter was either omitted altogether or was so adjusted as to provide for such relative periods of pause and illumination and periods of motion as are called for by this issue."

[THE END]

WIDER DRIVE-IN SCREENS

(Continued from page 14)

with a tilted, heat-reflecting, dichroic reflector. This reflector removes about 40% of the heat from the light beam, while it cuts down visible rays by only 6 to 8%. From a practical viewpoint, this slight decrease in light is of minor consequence.

A group of about half a dozen experienced engineers was gathered in one of our experimental projection rooms, and after dropping the heat reflector into the light beam, and then removing it several times, they all agreed that they could not tell, with any accuracy, whether the heat reflector was in or out of the light beam. This dishroic reflector is kept cool by a constant flow of air from a small blower.

Multiple-Channel Sound

The past season has marked the introduction of multiple-channel sound in the drive-in theatre. Fig. 3 shows a typical speaker post in the Belmont Auto Drive-In. Two junction boxes and four drive-in theatre speakers are

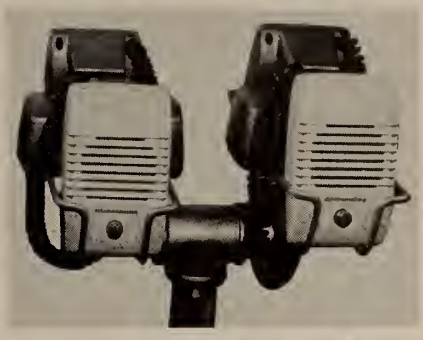


FIG. 3. Two separate speaker installation at the Belmont Drive-In, near Dayton, Ohio.

mounted on each post so that each car is equipped with both a right-hand and a left-hand speaker.

Four-track magnetic recordings of a conventional CinemaScope print are resolved into two-channel sound in the following manner: sound for the left side of the screen is impressed on the left-hand speaker, while that for the right side goes to the right-hand speaker.

Sound for the center of the screen is divided equally and impressed simultaneously on both the right- and left-hand speakers, so that the ear interprets the volume level to be the same as that for the sound already coming from each side of the screen. The sound effects track is divided in a similar manner.

(More on this, next page.)

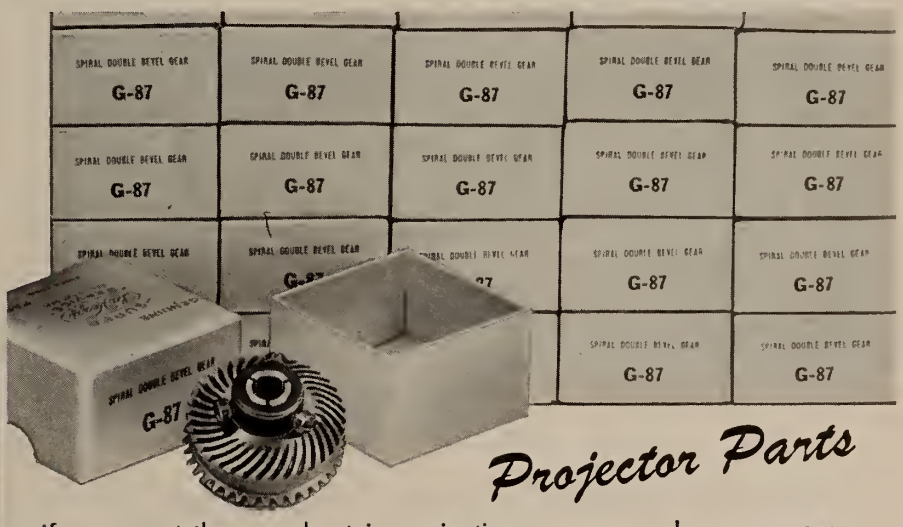
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A few years ago many of us felt that it might be impractical to attempt to introduce stereophonic sound in drive-in theatres. Because of this, we were extremely careful in our preliminary tests to be sure that the directional effect of this two-channel stereophonic sound was really effective.

Since both of the speakers in the car subtend a very much larger angle at the viewer's ears than is the case in a conventional indoor theatre, the directional effect is materially enhanced. One of our main concerns was that this enhancement might result in a lack of naturalness. Actual operating tests, however, have convinced us that the effect on the average patron is highly satisfactory.

The second important advantage of two speakers in one car is that obtained by the spatial effect of multiple-sound sources. This improvement has been so great that at the Belmont Auto Drive-In both speakers run continuously even on single-channel sound transmission from a conventional single-track print.

Two- vs Three-Speaker Units

Comparative tests of both two-speaker and three-speaker single units were carried on, and it was our conclusion that the two-speaker unit in a single housing was, in general, about as satisfactory as the three-speaker unit. Since the three-speaker unit is generally driven by three separate channels, this means that three complete separate channels of sound amplification and sound distribution must be employed.

Because of the elimination of a complete channel of amplification and distribution, either the double-speaker unit or the two separate speakers may be a more practical method of operation than the three-channel, three-speaker setup.

The double-speaker single unit is admittedly less cumbersome to handle, but it does not have as marked a directional effect on stereophonic sound as do the two separate speakers.

PROJECTION LIGHT SOURCES

(Continued from page 12)

dioxide gas which passes off; but the metallic oxides are solids which cannot burn.

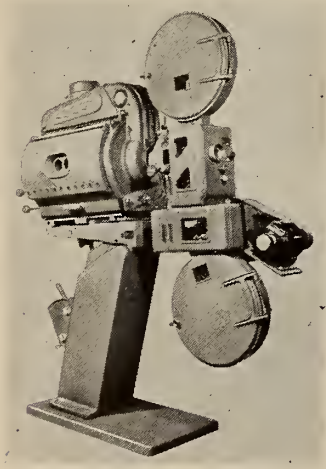
The rare-earth oxides are especially troublesome because they are "basic anhydrides" which react chemically with the "acid anhydride" of heated glass (silicon-dioxide) to form small amounts of rare-earth silicates. This chemical reaction "frosts," or etches, the surfaces of the glass near the top of the mirror where the arc dust normally settles.

Etching may be greatly delayed by wiping the dust from the mirror after every show with a clean, dry cloth. If the dust be left on the mirror day after day, no amount of scrubbing will remove it.

Cerium Carbide the Culprit

Pitting of H-I arclamp reflectors by copper splashings and by liquid cerium carbide ejected forcibly from the positive crater when the arc is struck presents a difficult problem. The inside dowser goes far to prevent mirror pitting, but it cannot wholly prevent it because an accidentally shortened arc-gap causes cerium carbide to be formed while the dowser is open.

Cerium carbide is a nuisance to



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the projectionist in two ways. As far as mirror pitting is concerned, this curious chemical compound eats holes in glass even more rapidly than does molten copper. First, the carbide is usually hot enough to melt the glass when splashed upon the surface of the mirror. Second, it exchanges its carbon atoms for the silicon atoms of the glass. Cerium silicide is produced by this reaction; and of the carbon atoms liberated, half remain admixed with cerium silicide as free carbon, and the other half take oxygen atoms from the glass and turn into molecules of carbon dioxide gas.

This complex and vigorous reaction leaves the pit marks filled with a black mixture of cerium silicide and carbon. The most energetic scrubbing and scraping fails to remove it, whereas copper droplets embedded in the glass come off quite easily.

It happens that the arc-burning conditions which favor the production of cerium carbide also cause jets of superheated carbon vapor to be shot out from the positive carbon. Now, the moment that the carbon vapor hits the surface of the mirror, it condenses to black soot, the purest form of carbon known. Even though soot does not react chemically with the glass, its blackness makes it an almost perfect absorber of arc radiation which it turns to heat. The temperature of the soot spots is sufficiently high to crack any but the strongest mirrors.

Regular Cleaning Essential

Moderate pitting fortunately does not appreciably impair the optical efficiency of a mirror. A film of arc dust has a much worse effect, yellowing the light as well as dimming it. Screen illumination may therefore be maintained at or near maximum levels by the simple expedient of washing arclamp reflectors at least once a week with strong soap and water. If badly pitted and etched, Bon Ami should be used in place of ordinary soap. The writer uses the cake form of Bon Ami because it is convenient to apply the Bon Ami to the glass surface with a wet cloth which is first rubbed on the cake.

At all events, the silver-protecting backing on the mirror should be kept dry, and any film of soap on the front of the mirror removed by rinsing with pure water and wiping with a *clean* cloth.

Now let's consider the second way in which cerium carbide hampers the projectionist. It pits mirrors, we know; and it also does something else. As stated previously, cerium carbide is formed in the white-hot positive crater when arc voltage (sometimes called "arc voltage-drop") is too high for the length of arc-gap employed. Stated in different terms, cerium carbide is formed whenever the arc-gap is too short.

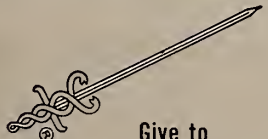
The temperature of the positive crater is so high, however, that the carbide boils and gradually evaporates even when it is not splattered upon the mirror. The vapor readily condenses upon any nearby object which is cool enough. The tip of the negative carbon, which is cooler than the positive crater even though glowing, is such an object. Cerium carbide vapor is carried across the hot arc-stream to the tip of the negative where it condenses as a red deposit.

Deposit on Carbon Tip

This red carbide deposit causes trouble for the projectionist because it is a non-conductor of electricity. If very much of the negative tip is



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covered by cerium carbide, arc voltage will drop and the light begin to flicker. The feed motor will then respond by shortening the gap, further aggravating the condition and possibly causing the negative to shade the positive crater from the mirror.

It is advisable, however, not to readjust the motor rheostat to decrease feeding speed, but rather to let the motor follow its natural inclinations. The carbide tip may be removed from the negative carbon when the end of the reel is reached.

Cerium carbide, although a stable compound, is gradually decomposed by the ever-present moisture in the air to form acetylene gas and cerous hydroxide. This hydroxide is itself oxidized by the air to a brown powder, cerium oxyhydroxide, which creates no operating difficulties.

The fact that cerium carbide takes a little time to disintegrate is of the utmost importance to projectionists. If the lamp is shut down for five minutes or less, the carbide may not have had time to decompose completely before an attempt is made to relight the arc. In such a case the insulating properties of the carbide may block the flow of current. The projectionist may suspect a bad connection in the lamp or ballast rheostat, and lose valuable show time in tracking down a defect which does not exist.

If the voltmeter reveals that the generator or rectifier is operative (showing that no fuses are blown), the projectionist should inspect the tip of the negative carbon before doing anything else when a H-I arc fails to light. The presence of cerium carbide is revealed by its red color; and the troublesome compound may be removed by filing it off or destroyed by moistening the tip of the negative carbon. Avoid a shock and an overturned projector by turning off the lamp-table switch before touching the carbons.

L-I arcs are free from mirror-pitting and carbide difficulties for the obvious reason that the arc-stabilizing cores of the L-I carbons contain no cerium or other rare-earth compounds. The potassium compounds in the cores of L-I positives produce a relatively light ash.

Lamp Circuits Not Complex

Arclamp circuits are electrically simple, consisting of direct connection of the carbons to the two output terminals of the apparatus which supplies the D.C. When the source has constant-volt characteristics, as is the case with generators for "parallel operation" (both arcs powered by a single generator), a ballast rheostat must be connected in series with each arc to counteract the tendency of the carbon arc to lose all its resistance to the flow of current.

No ballast is necessary, however, when the source has the falling-volt characteristics possessed by rectifiers and f-v generators, devices which can power only one arc.

The size of the wires and lead-in cables of an arclamp circuit is determined by the number of amperes flowing through the arc. Needless to say, the conductors should be several sizes larger than is actually needed, a precaution which eliminates the necessity of a complete rewiring job if the lamp equipment is ever increased in power.

This is a matter which should be given serious thought when the generator is located in the cellar or at some other point far away from the projection room. Line voltage-drop is not harmful in itself (it can be regarded as part of the ballast voltage-drop, and the ballast rheostats readjusted accordingly); but wires so small that the current heats them are dangerous and not permitted by building inspectors, insurance companies, or fire officials.

Care of Contact Surfaces

The connecting lugs and table switches, relays, *etc.*, require little more than infrequent, but periodic, examination of all contacting surfaces and the removal of corrosion and "burns" with the finest emery cloth. All such surfaces should be *polished*, not *roughened*, for roughening increases surface area and speeds corrosion. Connections should be tight enough to prevent the generation of heat by current flowing through them.

The condition of the silver or bronze carbon-contacting surfaces of the carbon-holders is also important. These should never be filed unless absolutely necessary. Quite aside from roughening them, use of the file runs the risk of destroying their flatness. They should be carefully polished by means of the very finest emery cloth wrapped around a suitable tool, but no more often than absolutely necessary.

Rotating-positive, H-I feeding heads require special attention. A wire brush serves to remove foreign particles, and fine emery cloth wrapped around a carbon may be used for polishing the actual contact surfaces. Badly burned and mechanically worn heads should be replaced.

[THE END]

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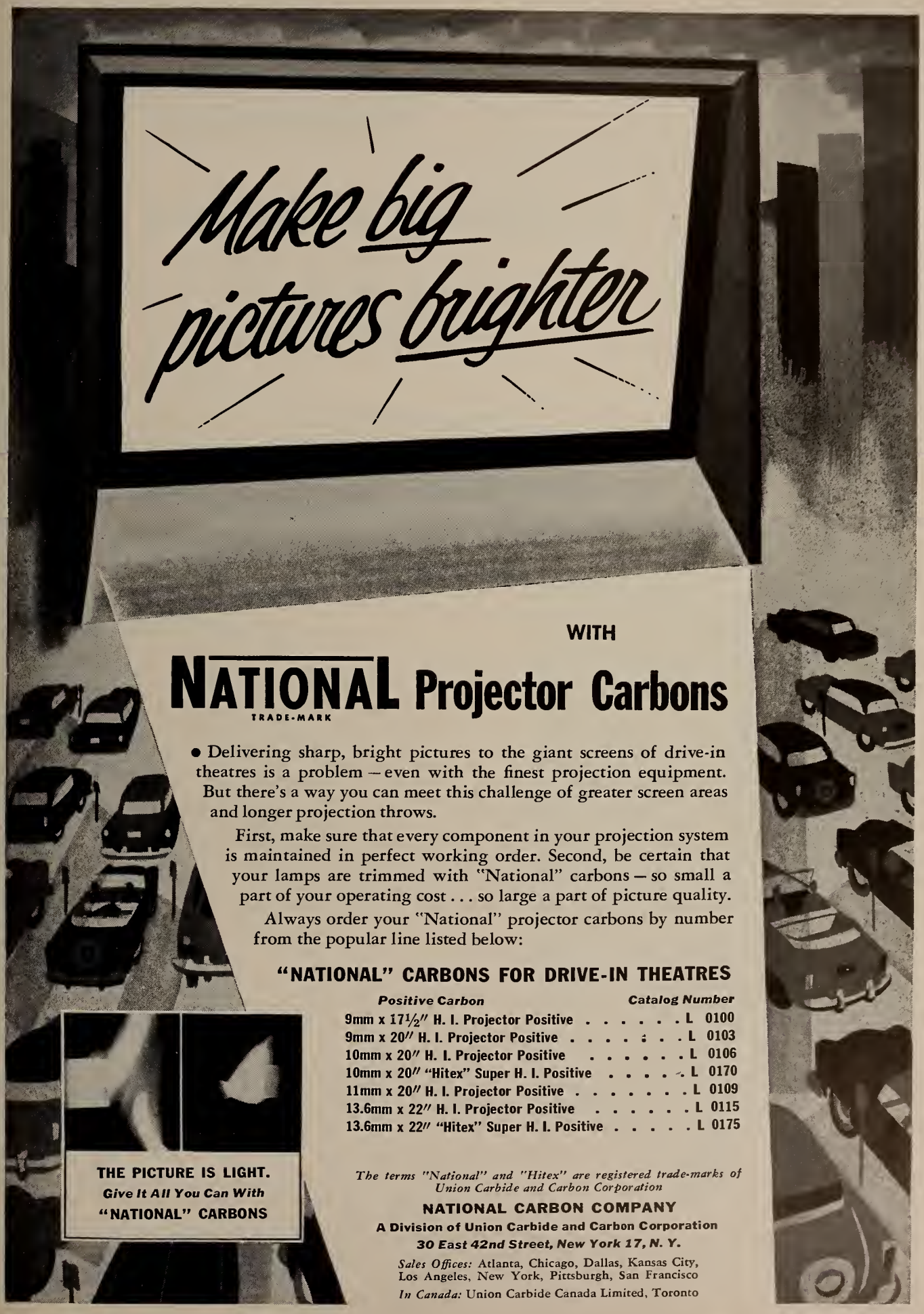
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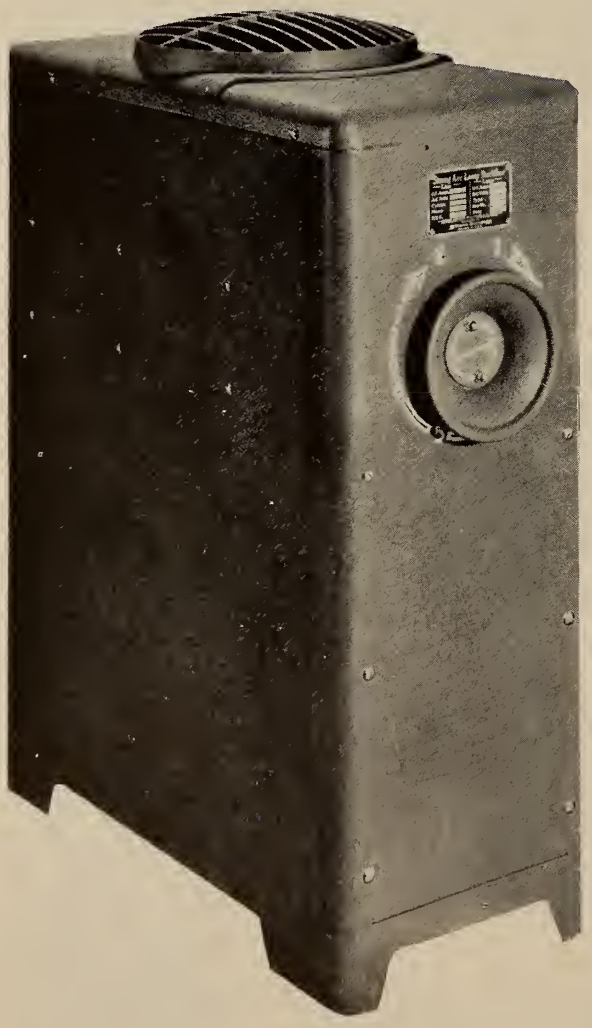
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9E

Monthly Chat

RESULTS of the finest projection effort we have ever seen, considering all the diverse elements which went into its doing, was put on view at the New York Paramount Theatre for the premier and subsequent showings of "Strategic Air Command." Similar fine results will undoubtedly be obtained in other key cities utilizing the same presentation technique, a massive screen image (62 feet wide, 32 feet high); double-frame film projected by horizontal-pull projectors, and great gobs of screen illumination even though the condenser-type lamps pull only 160 amperes.

For image resolution, depth of focus and a terrificly flat field over the entire expanse of this giant screen, we have never seen anything like it.

But even the obvious worth of the Vista-Vision double-frame film process does not alter our view that such a giant screen image is just too big for even the largest indoor theatre (New York's Radio City Music Hall excepted) unless it becomes standard practice to close off the orchestra entirely and confine viewing to the balcony at a distance of at least 60 feet. Even then, side seats in the balcony would be less than wholly acceptable.

Also, we dislike the curved screen (while only 3½ feet deep) and the aperture curved top and bottom, ala CinemaScope. We found it simply impossible, except in the far reaches of the balcony, to encompass this giant screen image (orchestra viewing being a complete bust) without employing a constant head-swiveling motion, both up and down, that speedily tired and constantly irritated the several people in our party. Also, the sound level was much too high, but this was no fault of the projection people but rather another salaam to the high priests of the "bigger and louder" cult.

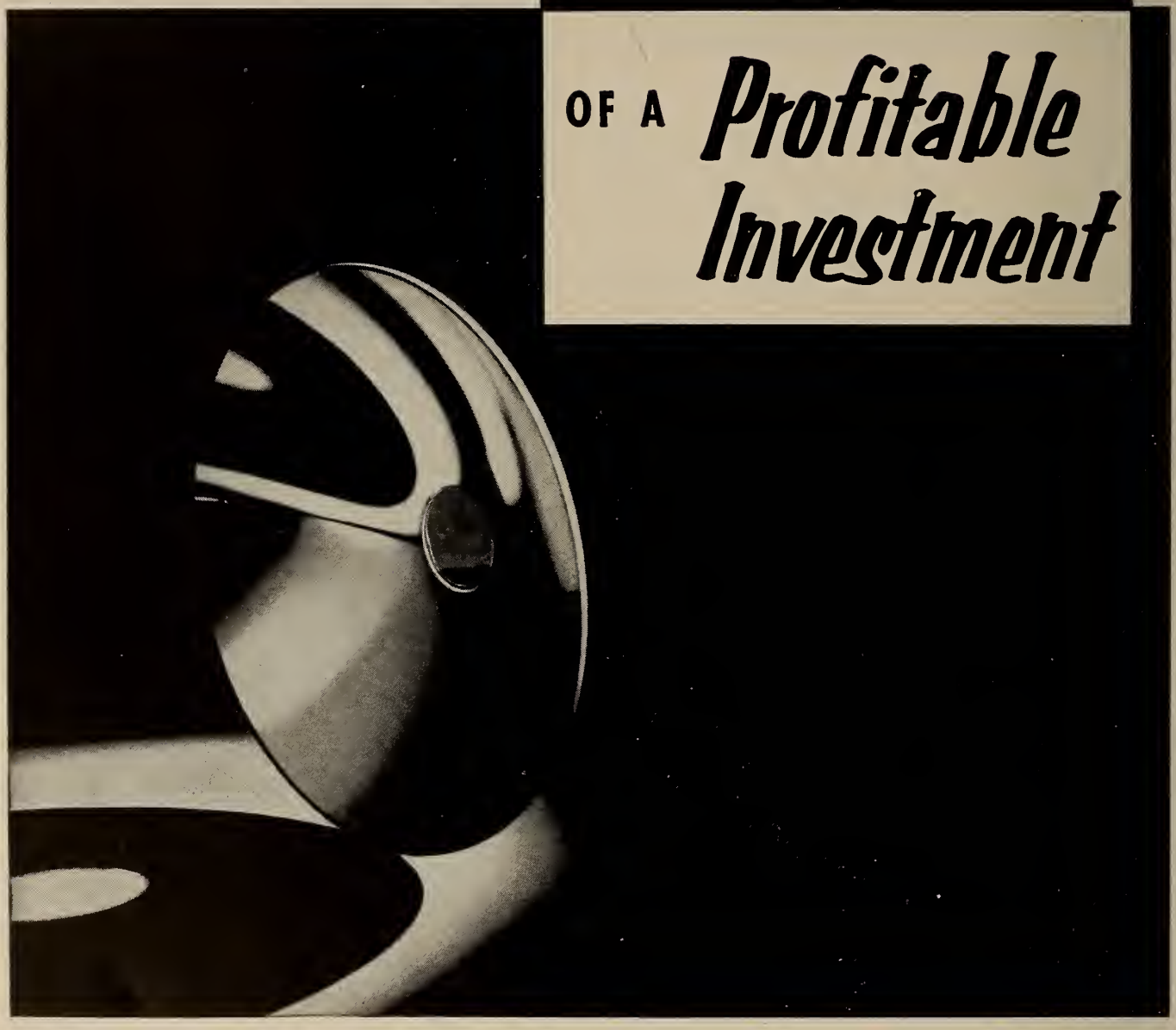
Of course, the pictorial content of "Strategic . . ." in *certain sequences* screamed for the "big" treatment; but in the indoor shots, especially those intimate boy-girl views, the effect was well-nigh ludicrous—as exemplified by a close-up of June Allyson in which her head is probably 20 feet high. After all, there *is* a limit to horizontal viewing tolerance.

Now, these giant screen images are great stuff for drive-ins which provide vastly improved sight lines (one wonders how they are ever going to up reflected screen light above the 4 foot-lambert mark, much less obtain an acceptable "field") but we may be thankful that the present mania on the part of producer-distributors is confined, in the indoor theatre group, to a very few large theatres.

Finally, we are convinced that projection problems—image size and equipment—be left to projection people and not dictated by producer-distributor personnel—even if they are studio or laboratory technicians.

EQUIPMENT manufacturers and dealers report that examination of exhibitors' books, freely offered for inspection, reveal that the murderous rental terms ranging from 50 to 90% of a theatre's *gross income* after operating expenses, which the distributor dictates, makes it impossible to expend any money on equipment which is desperately needed. Paramount Pictures' net profit in 1953, after taxes, was $6,779,563.

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VOLUME XXX MAY 1955 NUMBER 5

'Matching' Apertures and Lenses

By ROBERT A. MITCHELL

The selection and "matching" of apertures and lenses poses a difficult problem for the projectionist — the only technologically-minded person in or about the premises — not only in terms of technical but also economic considerations. Here in word and illustration is a means for simplifying this arduous task.

CONFUSION reigns! Whatever degree of standardization formerly existed with regard to picture format and aspect ratio has now vanished. Aperture plates by the dozen in differing aspect ratios are now available. And there are two commercial anamorphic processes in addition to conventional and non-anamorphic wide-screen projection.

Aspect ratios seldom bothered projectionists in bygone years. Even the introduction of sound-on-film in 1929 necessitated only slight changes in the *size* and *shape* of the screen. No one in those days was so rash as to slice any appreciable area from the height or width of a theatre screen.

The format of 35mm motion pictures was standardized in the earliest days of silent films in the serviceable 3:4 proportion—an aspect ratio of 1.333/1. Whatever the size of the screen, its width was always 1.333 times its height. The very thought of *widening* the screen was rank heresy!

First Aperture-Size Change

Old-timers recall the standard silent-film aperture—and also the nuisance of changing apertures when silent and sound-on-film subjects played on the same program. The projector aperture was originally 15/16-inch wide and 11/16-inch high. But even before sound came in, a slightly smaller silent aperture measuring 0.906" x 0.6795" was used by most projector manufacturers.

Notably, the standard silent aperture has a height-width proportion of exactly 3:4—an aspect ratio of 1.333/1. A picture of this ratio is projected on the screen when projection is horizontal—no "tilt" or projection angle.

The soundtrack occupies a strip about 1/10 inch wide. Now, when a strip of this width (more exactly, 0.106") was masked off, the sound track side of the silent aperture, the remaining opening (0.800" x 0.6795") was too nearly square in shape to be pleasing. The square-shaped picture was unavoidable when sliding-mask combination silent-and-sound apertures were used.

Dissatisfaction with the nearly square picture induced the restoration of the 3/4-proportioned aperture by "cropping" the height of the square-shaped sound film aperture. Thus came into being the 0.800" x 0.600" aperture, called the *proportional aperture*—proportional, that is, to the standard silent aperture and having an aspect ratio of 1.333/1.

Projection Angle Factor

But the proportional sound film aperture was not entirely satisfactory. It resulted in a projected picture having an aspect ratio of less than 1.333/1 when a substantial projection angle prevailed. The *average* theatre has a projection angle of about 12 degrees, which slightly elongates the picture.

To obtain an aspect ratio of 1.333/1 *on the screen*, therefore, a slightly wider aperture was proposed and adopted as standard in 1932. Although this aperture (0.825" x 0.600") has an aspect ratio of 1.375/1, it gives a picture having approximately the desired ratio of 1.333/1 when the projection angle is about average.

Until CinemaScope and wide screen appeared, the 0.825 x 0.600-inch aperture was the *one and only standard!* The shape of the screen, accordingly, presented no problems from 1932 to 1953, for both sound-on-disc prints and "straight silent" films had long since disappeared from the theatre field. Only the comparatively minor controversy of square vs. rounded

WIDESCREEN-ANAMORPHIC LENS- AND APERTURE-MATCHING TABLE

	LENS E.F. →	2"	2¼"	2½"	2¾"	3"	3¼"	3½"	3¾"	4"	4¼"	4½"	4¾"	5"	5¼"	5½"	5¾"	6"	6¼"	6½"	6¾"	7"	7½"	8"
NON-ANAMORPHIC	APERTURE																					WIDTH / HEIGHT		
	.825"X .600" (Ratio: 1.375/1)	.4125 .3000	.3667 .2667	.3300 .2400	.3000 .2182	.2750 .2000	.2538 .1846	.2357 .1714	.2200 .1600	.2063 .1500	.1941 .1412	.1833 .1333	.1737 .1263	.1650 .1200	.1571 .1143	.1500 .1091	.1435 .1043	.1375 .1000	.1320 .0960	.1269 .0923	.1222 .0888	.1179 .0857	.1100 .0800	.1031 .0750
	.825"X .497" (Ratio: 1.66/1)	.4125 .2485	.3667 .2209	.3300 .1989	.3000 .1807	.2750 .1657	.2538 .1529	.2357 .1420	.2200 .1325	.2063 .1243	.1941 .1169	.1833 .1105	.1737 .1046	.1650 .0994	.1571 .0947	.1500 .0904	.1435 .0864	.1375 .0828	.1320 .0795	.1269 .0765	.1222 .0736	.1179 .0710	.1100 .0663	.1031 .0621
	.825"X .471" (Ratio: 1.75/1)	.4125 .2355	.3667 .2093	.3300 .1884	.3000 .1713	.2750 .1570	.2538 .1449	.2357 .1346	.2200 .1256	.2063 .1178	.1941 .1085	.1833 .1047	.1737 .0992	.1650 .0942	.1571 .0897	.1500 .0856	.1435 .0819	.1375 .0785	.1320 .0754	.1269 .0725	.1222 .0698	.1179 .0673	.1100 .0628	.1031 .0589
	.825"X .446" (Ratio: 1.85/1)	.4125 .2230	.3667 .1982	.3300 .1784	.3000 .1622	.2750 .1487	.2538 .1372	.2357 .1274	.2200 .1189	.2063 .1115	.1941 .1049	.1833 .0991	.1737 .0939	.1650 .0892	.1571 .0850	.1500 .0811	.1435 .0776	.1375 .0743	.1320 .0714	.1269 .0686	.1222 .0661	.1179 .0637	.1100 .0595	.1031 .0558
	.825"X .412" (Ratio: 2/1)	.4125 .2160	.3667 .1831	.3300 .1648	.3000 .1498	.2750 .1373	.2538 .1268	.2357 .1177	.2200 .1099	.2063 .1030	.1941 .0969	.1833 .0916	.1737 .0867	.1650 .0824	.1571 .0785	.1500 .0749	.1435 .0717	.1375 .0687	.1320 .0659	.1269 .0634	.1222 .0610	.1179 .0589	.1100 .0549	.1031 .0515
ANAMORPHIC	C'SCOPE MAGNETIC .910"X .715" (Ratio: 2.55/1)	.9100 .3575	.8089 .3178	.7280 .2860	.6618 .2600	.6067 .2383	.5600 .2200	.5200 .2043	.4853 .1907	.4550 .1788	.4283 .1682	.4044 .1589	.3832 .1505	.3640 .1430	.3467 .1362	.3309 .1300	.3165 .1243	.3033 .1192	.2912 .1144	.2800 .1100	.2696 .1059	.2600 .1021	.2427 .0953	.2275 .0894
	C'SCOPE MAG.&OPT. .715"X .715" (Ratio: 2/1)	.7150 .3575	.6356 .3178	.5720 .2860	.5200 .2600	.4767 .2383	.4400 .2200	.4086 .2043	.3813 .1907	.3575 .1788	.3365 .1682	.3178 .1589	.3011 .1505	.2860 .1430	.2724 .1362	.2600 .1300	.2487 .1243	.2383 .1192	.2288 .1144	.2200 .1100	.2119 .1059	.2043 .1021	.1907 .0953	.1788 .0894
	C'SCOPE OPTICAL .839"X .715" (Ratio: 2.35/1)	.8390 .3575	.7458 .3178	.6712 .2860	.6102 .2600	.5593 .2383	.5163 .2200	.4794 .2043	.4475 .1907	.4195 .1788	.3948 .1682	.3729 .1589	.3533 .1505	.3356 .1430	.3196 .1362	.3059 .1300	.2918 .1243	.2797 .1192	.2685 .1144	.2582 .1100	.2486 .1059	.2397 .1021	.2237 .0953	.2098 .0894
	V'VISION ANAMORPH .825"X .600" (Ratio: 2.06/1)	.6188 .3000	.5500 .2667	.4950 .2400	.4500 .2182	.4125 .2000	.3808 .1846	.3536 .1714	.3300 .1600	.3094 .1500	.2912 .1412	.2850 .1333	.2605 .1263	.2475 .1200	.2357 .1143	.2250 .1091	.2152 .1043	.2063 .1000	.1980 .0960	.1904 .0923	.1833 .0888	.1768 .0857	.1650 .0800	.1547 .0750

Numbers in body of table indicate relative sizes of projected pictures. (The upper figure in each box denotes width; the lower, height.) To find actual size of picture in feet, multiply each of these two numbers by the projection distance in feet. To match height of non-anamorphic (wide-screen) picture with height of anamorphic (CinemaScope) picture, find a relative-height number in non-anamorphic section of table which is closest in value to the relative-height number corresponding to CinemaScope aperture and lens used. See accompanying text for further details.

screen corners marked this peaceful era; and whether the corners of the picture were sharp or rounded, the aspect ratio remained the same.

But now the peaceful era of motion picture projection has vanished into the past. There is plenty of uncertainty as regards standardization, and there is no end of hustle and bustle as the projectionist switches lenses, anamorphic attachments, and aperture plates. And along with all this confusion comes the pressing problem of choosing the most suitable aperture and lenses for the different processes now in use.

'Matching' Procedure Problems

"How in the name of heaven," asks the worried projectionist, "can I best match wide-screen projection to CinemaScope? or to anamorphic VistaVision? Many patrons wouldn't notice too much difference between CinemaScope and wide-screen if it weren't for those blank areas at the sides of the screen during non-anamorphic, wide-screen projection."

The immediate problem, then, is one of aspect ratio and picture size. And the most obvious fact of all is that anamorphic (CinemaScope) and non-anamorphic (wide-screen) pictures cannot be *exactly* matched unless both pictures have *exactly* the same aspect ratio. If they do, the problem consists merely of selecting the right projection lens to use with each process.

CinemaScope has the greatest aspect ratios of all the different processes for regular theatre use. These aspect ratios are 2.55/1 for magnetic-track CinemaScope prints, and 2.35/1 for optical-track prints.

Both of these CinemaScope ratios are somewhat greater than we should care to recommend for non-anamorphic wide-screen projection. A wide-screen aperture, being smaller than a standard aperture, wastes light, and the greater its aspect ratio, the more light it blocks off. CinemaScope, on the other hand, passes maximum light to the screen because its aperture is much larger than a wide-screen aperture.

CinemaScope Image Advantages

CinemaScope pictures, then, look brighter than non-anamorphic wide-screen pictures. They are also less subject to vertical picture unsteadiness because less magnification is involved in the vertical dimension. But sidewise weaving of the picture is magnified by *both* CinemaScope and non-anamorphic wide-screen projection,

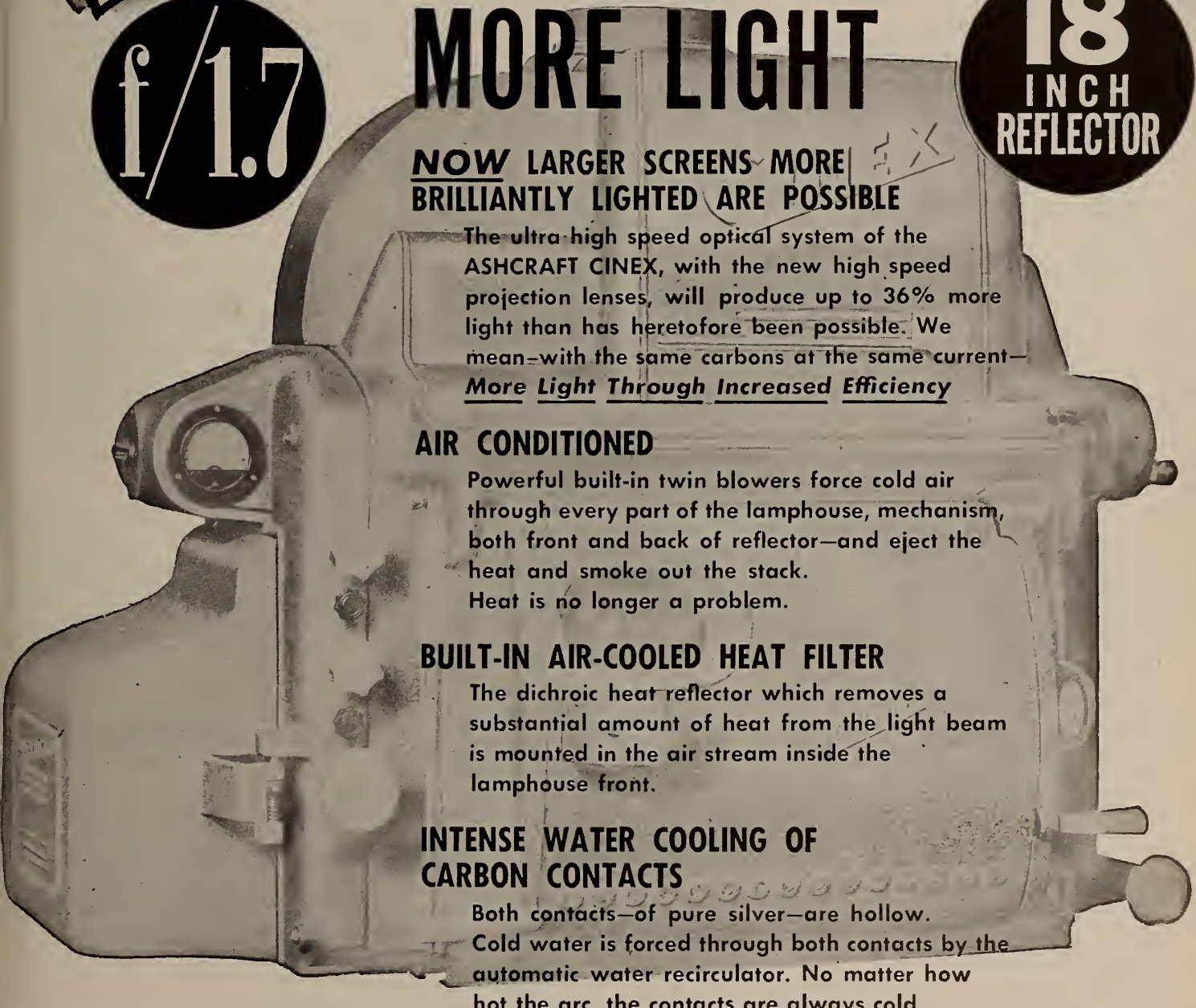
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The dichroic heat reflector which removes a substantial amount of heat from the light beam is mounted in the air stream inside the lamphouse front.

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Both contacts—of pure silver—are hollow. Cold water is forced through both contacts by the automatic water recirculator. No matter how hot the arc, the contacts are always cold.

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RCA Amplifier Systems from 70 to 1200 watts reproduce optical or magnetic sound with *real* high fidelity for the smallest to the largest drive-ins. Vital stand-by safety features make sure your sound goes on despite emergencies. There's good listening for patrons when RCA In-Car Speakers and Junction Boxes deliver sound with fidelity right to every car. Choose from a variety of models in a wide price range. With an RCA "Button-On" Soundhead, magnetic sound costs less than you think. A "Button-On" Soundhead catches—*on single or multiple track*—all the fidelity, clarity and natural quality typical of advanced magnetic sound.

It's a fact . . . patrons look for wide screen and the better pictures produced with these new processes. It's a fact . . . RCA offers you a wholly new wide-screen conversion plan with a revolutionary payment schedule . . . allowing you to pay for moderately-priced RCA equipment from daily box-office takes. Your independent RCA Theatre Supply Dealer can give you this all-new RCA conversion story *today.* Call him . . . and profit!

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and is of the same order whenever picture widths are the same.

The CinemaScope picture is also less subject to the focus-destroying effects of film flutter and buckling at the aperture than is wide-screen; but whether CinemaScope is actually *clearer* than ordinary wide-screen depends upon the quality of the print, the projection lens, and the anamorphic attachment.

Inherent Deficiencies Magnified

Despite recent improvements in the photography and printing of 35-mm films, no type of wide-screen picture, anamorphic or non-anamorphic, is as sharp, rock-steady and brilliant as the conventional 3/4-proportioned picture. Non-anamorphic wide-screen, in particular, suffers from inefficient illumination of the picture and from inherent defects of projection with short-focus lenses—magnified emulsion-grain, decreased contrast and clarity, film-flutter, and mis-registration and unavoidable dye-bleeding in color prints. Patron complaints of "poor focus" are nowadays very frequent; and, naturally, the projectionist is blamed.

All talk of alleged "progress" in motion picture technology to the contrary, the surprisingly high degree of brilliance and clarity of latter-day silent movies—those filmed from 1925 to 1929—has never been surpassed by *any* process, and only rarely equalled by conventional sound-on-film pictures. Projection of an original high-quality 35-mm silent print never fails to astonish people who somehow have acquired the notion that all "silents" were technologically crude. Even though there was less emphasis on strict "naturalness" in the old days, greater attention was applied to pictorial excellence and dramatic photographic effects.

Decide First on Preference

The welter of aperture plates and lenses that confronts us today is, all things considered, a necessary accommodation to a mass mind which is realistic rather than idealistic, anti-emotional rather than anti-intellectual. We have CinemaScope and wide-screen simply because the public wants them.

The easiest way to choose apertures and lenses for any theatre is, first, to decide what kind of effect is wanted (aspect ratios matched or not?) and second, to use the accompanying table, soon to be explained, to find out which apertures and lenses are needed to produce the desired results. This table contains no non-anamorphic wide-screen aspect ratio greater than 2/1 because we do not approve of greater ratios for wide-screen projection without anamorphic attachments.

Fortunately, 2/1 CinemaScope apertures are available for both magnetic- and optical-track prints. Those who insist upon matching wide-screen to CinemaScope should use this aperture (0.715″ X 0.715″) and, for ordinary wide-screen projection, the non-anamorphic 2/1 aperture (0.825″ X 0.412). Two different lenses are needed, of course, and the table will enable you to select them without any guesswork.

Proscenium Opening Area

Most projectionists are rightly opposed to so great an aspect ratio for wide-screen, and many of us (including the writer) feel that the aspect ratio of CinemaScope should not be cut down unless the theatre stage is too small to hold the widest screen.

The pictorial effectiveness of CinemaScope depends entirely upon its panoramic sweep; its enormous expanse of screen. *Width* is what CinemaScope is for; but, on the other hand, it is absurd to use the full CinemaScope aspect ratio on a little 20-foot stage. In a small theatre the CinemaScope screen looks like a mere ribbon-like section of a regular 3/4-proportioned screen.

Width-Matching Indicated

The best that can be done in most instances is to match the CinemaScope and wide-screen *heights*. When this is done, the non-anamorphic wide-screen width is somewhat less than the CinemaScope width. In a few theatres of the narrow type, it may be advisable to match *widths*, resulting in a wide-screen height slightly greater than the CinemaScope height.

Now for our table. Picture width for non-anamorphic projection is calculated by the following formula:

$$\text{Width} = \frac{\text{Aperture Width X Throw}}{\text{E.F. of lens}}$$

while picture width for anamorphic projection is found by:

$$\text{Width} = \frac{\text{Aperture Width X Throw X Expansion}}{\text{E.F. of lens}}$$

The "expansion" in the last formula refers to the expansion-factor of the anamorphic attachment, being 2 for CinemaScope and 1.5 for anamorphic VistaVision.

Picture-height is found for *both* anamorphic and non-anamorphic pictures by a single formula, namely:

$$\text{Height} = \frac{\text{Aperture Height X Throw}}{\text{E.F. of lens}}$$

In each of these formulas all dimensions and distances should be in inches or fractions thereof. (Which means that the projection throw should be converted into *inches*.)

The numbers in the body of the accompanying table were calculated by means of these three formulas, *but with the factor of "throw" (projection distance) omitted.* The omission of "throw" results in values which may be converted into actual picture widths (top figure in each box) and picture heights (bottom figure in each box) by multiplying them by the "throw" which exists in your theatre. If you multiply by the "throw" *in feet*, picture dimensions will come out *in feet.*

For aperture- and lens-matching purposes, however, it is not necessary to do any multiplying. The table may be referred to directly, as we shall now explain.

1. TO MATCH WIDE-SCREEN HEIGHT WITH CINEMASCOPE HEIGHT.

What focal length of lens are you using for CinemaScope? Locate the vertical column headed by that lens E.F. Then, reading horizontally, find in that column the box opposite the CinemaScope aperture (or aspect ratio) which you use. In the box thus found are two figures: the upper one being the relative picture width, and the lower being the relative picture height. *Take note of the number denoting relative picture height.*

Now hunt through the non-anamor-

(Continued on page 33)

"The Big Track of Time"

Competition can be as stimulating in research as in manufacturing and merchandising. Electronics, in the race to achieve new triumphs, is run on the big track of Time, on which there is room for all who would compete. There is no finish line.

David Sarnoff
Chairman of the Board, RCA

Bigger Drive-In Pictures Require Big-Scale Thinking

Deciding to enlarge the screen image at a drive-in is one thing; choosing the requisite equipment is much more complicated. Here are some tips thereon.

THE drive-in is a phenomenon in the motion picture exhibition field. Looked down upon for years as a sort of rowdy, backwoods substitute for the conventional Main Street movie theatre, drive-in theatres are now mushrooming and are attracting patrons despite the fierce competition from home Tv.

The drive-in construction boom has been of great benefit to the industry at large. In the past, however, putting on a drive-in show created difficulties for working projectionists called upon to solve many problems in presenting a picture on a big outdoor screen with equipment that was largely designed for the vastly different conditions of the indoor theatre.

Piling Size Upon Size

An additional problem arose during the last year when the "wide-screen" idea began to spread to drive-ins. The areas of already-large outdoor screens are now being increased to sizes that would have brought forth hoots of derision had they been suggested just a short time ago.

The appended information is selected from recent announcements by manufacturers of drive-in theatre equipment who are now marketing products designed to solve the formidable problems of outdoor projection on giant screens:

Enlarging Screen Towers

"Great care and considerable thought should be exercised before going ahead with a plan to enlarge a drive-in screen tower," asserts F. W. Keilhack, sales manager for the Drive-In Theatre Mfg. Co., of Kansas City. "The exhibitor must forget the race to have a larger picture than his competitor, or to be able to advertise the 'largest screen in the world'."

Almost daily there are calls from all over the country for wide towers or extensions—the wider the better. Consultation discloses that no thought has been given to sight lines, maximum comfortable viewing width at given points, width restrictions due to given lens sizes, or to the amperage needed in projection to maintain a sufficiently bright picture.

Plans for converting existing towers for a wide-screen ratio should be an "engineered" job—by competent consultants. The drive-in tower is not just another structure that any local mechanic can throw together with little or no thought. State building codes have become more stringent, and insurance companies are revising their requirements and rates. In most states, for instance, insurance rates on steel towers vary from one-half to one-fourth the rate on wood towers.

Foundation Strength Vital

Before enlarging an existing tower, it must be borne in mind that the foundation of that tower was calculated and designed for the weight of *that* tower and for given wind stresses. Any attempt to increase tower height unless the foundation is reworked should be discouraged. Also, projectionists should strongly urge that extensions to the screen tower rest entirely on their own foundation and frame. Methods that fall short of these recommendations are likely to result in costly damage during a bad storm.

To withstand the forces exerted upon towers by winds of various velocities, the tower and foundation must have a basic design with a minimum resistance of 30 pounds to the square foot, which will enable it to withstand winds up to 90 miles per hour. A safety factor of from 20% to 50% is usually added to this figure so that a tower is capable of withstanding winds of from 120 to 125 miles per hour.

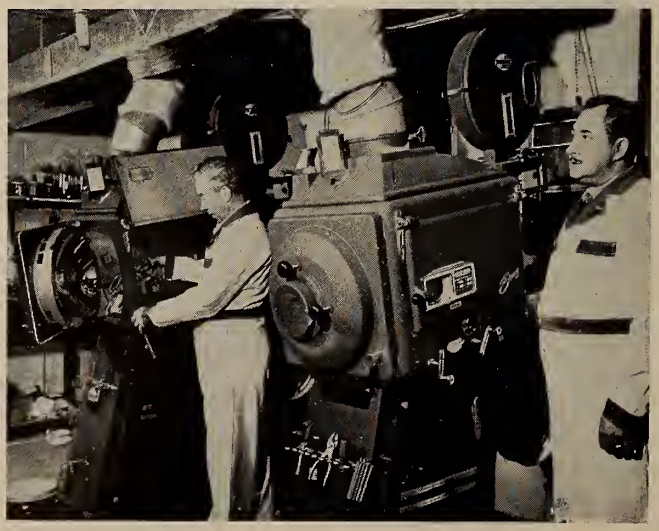
"The actual wind resistance of the tower," adds Keilhack, "results from a combination in design of the foundation and steel framing, plus planning so that the ultimate stress on the supports of a steel tower will be only one-third of their established breaking point.

"The controversial question of whether a drive-in screen should be curved or flat we leave to the exhibitor and his technical help, as our towers can be fabricated either way. We do feel, however, that a proper curve can improve the picture in certain installations by reflecting light to the opposite extreme sides."

Forward Tilt of Screen

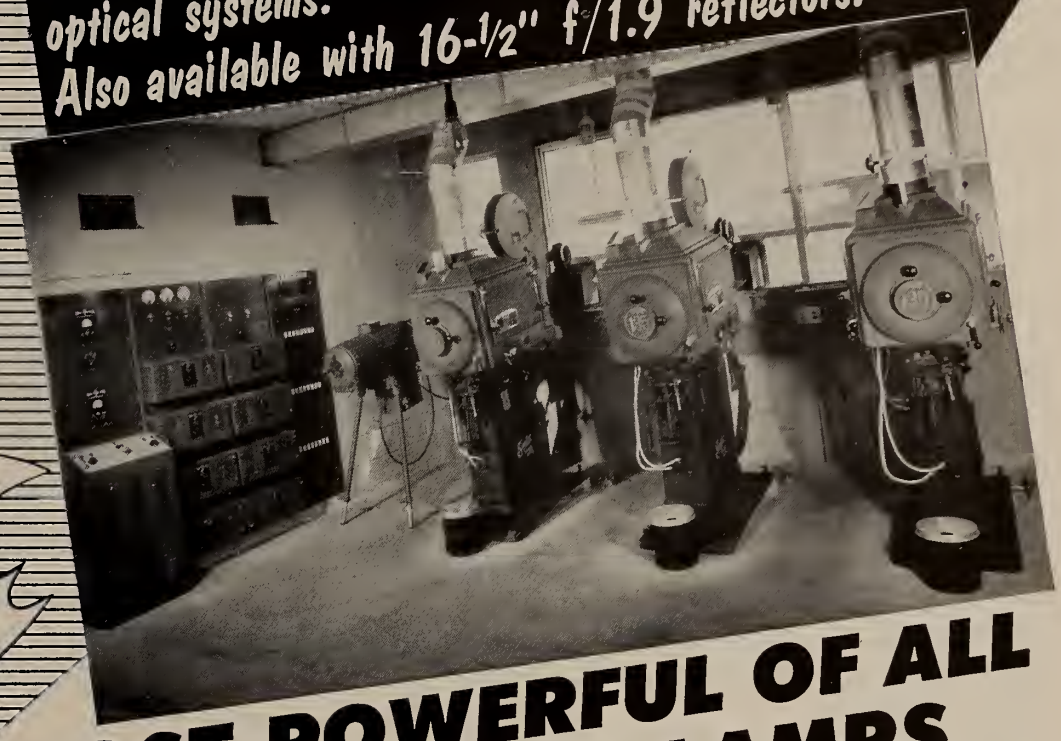
A forward tilt of the entire screen surface is very important in conserving light—directing it at the cars instead of wasting it toward the sky. In most cases a tilt of more than 6 or 7 degrees is not desirable. A tilt of one foot forward for each 10 feet of height is about the average required.

When a screen tower is painted white, the color contrast and color balance is better than with reflective-type paint, according to well-informed opinion. However, there are several



First installation of the improved Strong "135" arclamp with 18-inch reflectors (IP for April) was in the 41 Twin Drive-In at Milwaukee, Wis. Having a capacity of 2000 cars, the screen is 130 feet wide by 60 feet high. Shown here are Don Fretch and Harry Rotter, members of IA Local 164, Milwaukee.

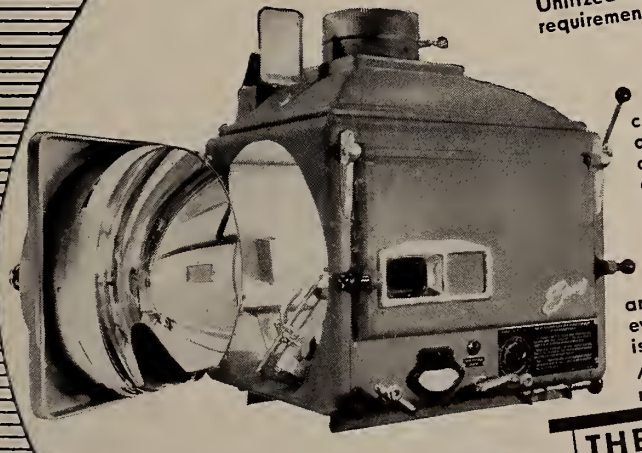
The *Strong* 18" f/1.7 Reflector Super "135" for theatres with f/1.8, f/1.7 or f/1.5 objective systems and projectors cleared for these high speed optical systems.
Also available with 16-1/2" f/1.9 reflectors.



Shown is installation of Strong Super "135" lamps at the Miracle Mile Drive-In, Toledo, Ohio. Installation by Theatre Equipment Co., Toledo, Ohio.

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NEW Strong Infra Ban Beam Cooler blower fan. New removable filter holder.

Exclusive Lightronic crater-positioning system automatically maintains the correct arc gap length and correct position of the positive arc crater at the EXACT focal point of the reflector. A perfect light, evenly distributed, of constant intensity and unchanging color value, is maintained at the screen without manual adjustments.

A jet of air stabilizes the burning arc and prevents deposit of soot on reflector.

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**** Film does not buckle even when run for four consecutive 20-minute periods! * Gate temperature held at only 5° above room temperature (as opposed to a temperature of 190° for a non water-cooled gate). Immediate rethreading possible without burned fingers.***

These tests were run on Motiograph AAA projectors equipped with 52° shutter blades and high-intensity reflector type arc lamps burning rotating positive carbons at 135 amperes and WITH NO FILTER.

These water-cooled film gates and aperture cooling blowers are now available on new Motiograph AAA projectors, and are also obtainable for Motiograph AAA and AA projectors presently in use.

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schools of thought on this subject. "Where a drive-in screen is not surrounded by scaffolding or ornamentation at the top and sides," Kielhack concludes, "we urge that the use of black masking be discontinued and that the picture overshoot the screen tower to eliminate keystone, with the black of the night serving as masking."

Aluminum-Plated Screen Surface

The Motion Picture Research Council recently made an announcement of considerable interest to owners and projectionists at large drive-ins where a white-painted screen cannot return a high light level. The Council has developed an all-aluminum screen that controls the direction of reflected light so that it reflects in a flat fan-shaped pattern which just covers the area occupied by the drive-in ramps.

From the sky, the aluminum screen appears dark; but from the ramps it is 300% brighter to the eye than a screen painted white, according to the Research Council. [Ed.'s Note: This we have to see.] Made from aluminum plating with a surface of small continuous vertical grooves, it is said to reflect light to an angle of 45 degrees from one side of the screen with little fall-off despite the directional reflective characteristics of the aluminum.

This aluminum screen is fabricated of panels 6 inches wide and 6 feet long by the Manco Plating Co. of Los Angeles, under license from the Research Council. The surface of the panels is treated with an electrolytic oxide coating which is said to produce a hard, weather-resistant finish. No painting or maintenance other than washing is required, it is said.

Bigger Lamps Necessary

Arclamp manufacturers have been well aware that the job of providing the equipment to light giant drive-in screens rests squarely with them. To fill these bigger screens with an acceptable picture new lamps are usually needed, such as the standard Peerless Hy-Candescent condenser-type lamp designed to burn as high as 180 amperes with 13.6-mm carbons, and new high-powered reflector lamps manufactured by the Strong Electric Corp. and C. S. Ashcraft Mfg. Co. A similar high-powered reflector lamp is also available from RCA.

The features of the new Strong and Ashcraft lamps have been reported on in detail in IP during the past few months. The new Ashcraft lamp was described in IP for March; and an article on the new Strong lamps with automatic arc-gap control, written by Arthur Hatch, appeared in IP for April. Both of these lamps feature 18-inch mirrors and internal blower systems to remove heat from the reflectors and other parts of the lamp. The Ashcraft lamp is also fitted with water-cooled carbon contacts.

However, since the great heat developed by these powerful lamps requires cooling measures within the lamp itself, it is easy to see that their light beams will have a pronounced effect on the fragile strip of film moving past the aperture.

Controlling Heat on Film

In the past few years filters of heat-absorbing glass have often been placed between the light beam and the aperture to eliminate a large proportion of the light's heat rays while passing most of the available light. But now lamps have become so powerful that the heat problem has again become critical. Also, in order to match the larger reflectors and transmit all the extra light produced to the screen, F/1.8, F/1.7 and even F/1.5 lenses are being used. The depth of focus of these lenses is much more critical than slower lenses, and buckle or flutter of the film due to heat becomes much more noticeable on the screen. It became necessary therefore, to incorporate in the projector head some means of cooling the film directly when these latest arclamps are used at full power.

Film cooling is being accomplished in the latest projector models by means of water-cooled film gates and air-blower systems trained directly on the film. Elsewhere in this issue of IP will be found an account of an air and water-cooling system now available for Motiograph projector heads. A water-cooled film gate has been a standard component of the Century projector head for some time.

Larger Film Image

A development that may in the future become most important to drive-in projection is the use of a larger film image such as the widely-acclaimed double-frame horizontal Vista-Vision print. A specially-designed Century projector handles these V-V prints. Projectors such as the horizontal type and others now being designed to accommodate film widths from 55- to 70-mm provide large drive-ins with a method of greatly improving the sharpness and clarity of their pictures in addition to raising their light levels.

Considering the many ramifications of drive-in operation, one thing is certain: when considering changes of any sort the best insurance for satisfactory performance is to consult those who specialize in such matters — either structurally or equipment-wise. It might not be a bad idea either, to solicit some sort of *warranty as to performance* under given conditions and over a given period of time. Past experience proves this wise.

Increased Attendance Seen

Weekly motion picture attendance that will average from 50 to 55 million and theatre gross revenue that may reach $1.3 billion are forecast for the year 1955 by the financial research firm, Standard and Poor's. The Wall St. Firm also expects that film production companies will moderately exceed their profits of last year, but points out that theatre profits will be limited by increases in film and other operating costs.

Theatre attendance during the early months of 1955 was estimated at about 50 million weekly. It was predicted that drive-in attendance figures, when the outdoor season gets into full swing, may raise the yearly average as high as 55 million. This compares with an average of 49 million in 1954 and 46 million in 1953.

The Wall St. firm sees around 19,000 theatres in operation or ready for operation in early 1955, including some 4,100 drive-ins, to be increased by mid-year to more than 4,500. The larger number of theatres, plus a prospective attendance gain and higher net admission prices are said to raise the possibility of a $1.3 billion gross, against $1.2 billion last year. It is pointed out that theatres this year will reflect full-year benefits from reduced Federal admission tax, which became effective April 1, 1954.

"Theatre operators, however, are handicapped by increases in film and other operating costs," Standard & Poor's cautions, "and any further improvement in 1955 earnings will be small at best. Profits of major producers may show moderate gains this year, aided by an expected rise in revenue from abroad, but gains are expected to be less than those registered in 1954.

Standard & Poor's sees some slackening in the demand for new theatre equipment this year, pointing out that most of the large theatres have been renovated. However, the report continues, "sales should nevertheless continue at a relatively high rate."

The CinemaScope Trailer

"Sandwiching" a short length of 'Scope film into a program is difficult in most projection rooms. Here is a workable procedure.

By Joseph F. Holt
Member, IA Local 428,
Stockton, Calif.

NATIONAL Screen Service recently notified theatres which exhibit CinemaScope attractions that all trailers are to be furnished in anamorphic picture version with magnetic sound unless the theatre is already listed as preferring the optical-sound version. Cited is the fact that screening a CinemaScope trailer in a wide-screen ratio other than the one in which it is released detracts from its appeal, and that the use of the CinemaScope picture and sound is desirable "even if it should be necessary to hold a short intermission" for changing lens and aperture.

Although many theatres have been using the normal-picture trailer on CinemaScope productions, there are some that have been using the anamorphic-magnetic type even though it might be the only such subject in the entire program. Here is a simple and effective means of screening a single trailer without a visible break in screen continuity.

Propectionists not blessed with a 3-or-4 projector room (the vast majority) have always been quick to seize upon any method which will overcome this handicap. The basic idea suggested here was used widely in screening Magnascope during the 1930's.

The "Sandwich" Routine

The strange thing about what we call "the sandwich routine" is that even those old-timers who used this simple method years ago have forgotten about procedure which will solve *any* problem of inserting a short segment in a program.

Consider a representative program and determine how the "sandwich" method is used. The program is one where we have two "normal" features, news and cartoon together with one "normal" prevue trailer and one CinemaScope-magnetic trailer. Suppose that the routine is as follows:

Feature 1
Prevue opening
CinemaScope trailer
Also on same program strip:
"Normal" trailer
News
Cartoon
Feature 2

Leader which is *blank* should be inserted between the prevue opening trailer and the "Also" strip. The purpose of the blank strip is to provide 40 or 50 feet of film for cooling and halting the projector which is to screen the "normal" film following the CinemaScope trailer.

The writer has found that 50 feet of blank film provides adequate time under almost any condition, but while the actual length of blank film is not critical, it is extremely important to follow the blank film with a readily identified strip such as white opaque. The white opaque indicates that the blank section is finished, and if followed by the starting footage used in the room, will make an accurate changeover from the short insert easy and reliable.

Accordingly, our reel makeup might look something like this:

Reel A: Final reel of Feature 1
Prevue opening
Blank film (50 feet)
White opaque tally
Start footage (8 or 9 feet)
Also on same Program strip:
"Normal" trailer
News
Reel B: Leader (2 to 3 feet shorter than prevue opening)
CinemaScope trailer
Blank tailpiece

When reel A is started, reel B is threaded in the idle projector. When the prevue opening trailer appears, if the leader on the CinemaScope trailer has been properly chosen, reel B is started and the trailer will be at the aperture when the prevue open strip is finished. At this time the changeover is accomplished and focus of the CinemaScope trailer is checked.

Reel A is now watched as it comes off the upper reel. When the opaque strip appears, the machine is halted so that the proper starting footage remains between the aperture and the strip which is to follow the CinemaScope trailer.

At the cue on the end of the CinemaScope trailer, reel A is started and continues to screen, while the projector which was used for reel B is made ready for the remainder of the program.

There is no need to detail some of the other situations which arise. The experienced projectionist can readily work out reel mountings which will provide the length of time he deems necessary to make complete changes in projection systems.

Optical-Magnetic Switching

Whatever the requirements of the program, be sure to mount together film which is projected with like methods of visual projection. It is not difficult in most projection rooms to obtain sound switching between optical and magnetic sound, but it may be that your CinemaScope-magnetic aperture will show the optical sound track if used on CinemaScope-optical prints.

If your pedestals are not readily movable in the lateral direction, management should be encouraged to provide base-shifters. Off-center titles are unnecessary and give the impression that *you* are careless.

Provide some means of reminding the projectionist that the particular reel he is now threading differs from the last one. Write on strips attached to the leader that the film on that particular reel is CinemaScope and magnetic sound. If that particular reel is the only one of its type in the program, it is extremely easy to neglect to thread through the magnetic soundhead. Applying these suggestions you will be on the way toward easy and trouble-free use of CinemaScope trailers of whatever length.

New Ace ClearVision Splicer

The Ace ClearVision non-magnetic film splicer suitable for splicing all types of 16- and 35-mm film is now in production and will be marketed shortly by Camera Equipment Co., 1600 Broadway, New York City. Developed by Irving Merkur, well-known projectionist-manufacturer, who is already credited with the Ace cuemarker and the Ace reel-end alarm, this new splicer is perfectly adapted for speedy, sure splicing of all film—with either a straight or diagonal cut—including the new DuPont polyester Cronar film described in IP for March, 1955, p. 7.

The ClearVision splicer was explained and demonstrated at the May meeting of the 25-30 Club of N. Y. City as this issue of IP was on the press.

Bulb Rectifier Anatomy, Operation

Some projectionists in our Local advocate leaving the A. C. power turned on in the rectifiers at all times. They assert that if the bulb be left on even while the arc is not operating, it helps to prevent the filament from sagging; while turning off the bulb causes the filament to be continuously heating and cooling, expanding and contracting. Which is preferred practice, and what effect does either procedure have upon bulb life?

ALFRED G. QUINN, Local 299, Winnipeg, Man., Canada

The appended communication provided an excellent opportunity for a detailed exposition of the basic principles, structure and operation of an important projection unit—the tube rectifier.—EDITOR.

IP's Viewpoint

AS far the life of Tungar-type rectifying bulbs is concerned, it makes no discernible difference whether the bulbs are turned off when not in actual use or left on during the entire show period. There are other factors to be considered, of course, such as wear and tear on switches, reactance kickback, and the possibility of accidental application of plate load when the filaments are not up to full operating temperature.

Some of these factors, such as minor mechanical wear and tear, require no discussion. Other factors which influence the useful life of these tubes warrant explanation.

Intermittency Not Harmful

True, the filaments of rectifying bulbs expand as they are heated, and contract when cooled; but it is also true that no appreciable amount of permanent filament sagging results from intermittent operation. Moreover, a slight sag of the filament, even when present, does not impair the functioning of these bulbs.

Because the filaments of Tungar-type rectifying bulbs are operated at a temperature somewhat below white heat, evaporation of metal from the heavy filaments is a negligible factor in spite of the fact that the gas pressure in these bulbs is rather low, seldom exceeding 10 mm of mercury. Of far greater importance, as regards the useful life of rectifying bulbs, is the special composition and molecular structure imparting maximum electron-emission characteristics to the filament.

The filament of a rectifying bulb, unlike that of an ordinary light bulb, contains thorium. The thorium increases the emissivity of the tungsten. The last stage of manufacture involves a process whereby the thoriated tungsten filament is raised to white heat to bring the thorium to the surface of the tungsten wire and produce an electronically-active form of the metal. The desirable electron-emitting properties of this specially prepared filament are definitely impaired by incorrect operating conditions.

Structure of Tungar Bulb

A Tungar-type rectifying bulb is a *diode*, or 2-element tube. One element is the *cathode*, or negatively-charged electron-emitter. In the Tungar-type bulb, the filament itself serves as the cathode. The other element is the *anode*, or positively-charged plate to which the electrons are attracted by the electromotive force supplied by the secondary winding of the transformer. The cathode is made of graphite, a substance which best withstands the heating effects of heavy electron bombardment.

High-voltage, low-current rectifying bulbs are *vacuum* tubes; but Tungar-type bulbs are *gas-filled* to make them low-voltage, heavy-current devices. The gas employed is usually argon, one of the chemically inert gases, and only a small amount is admitted to the bulb. It is the gas-ionizing action of the clouds of electrons given off by the hot filament which produces the blue-violet glow surrounding the filament. The presence of this glow indicates that the bulb is operative.

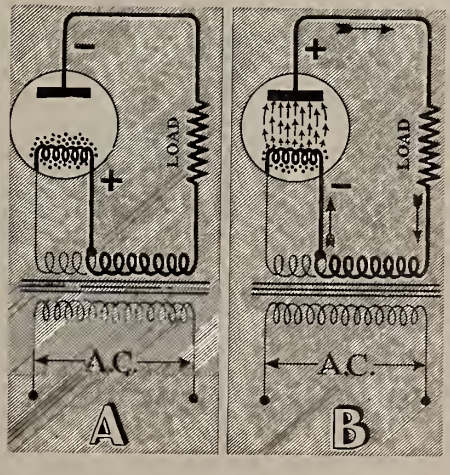


FIGURE 1

A. Electrons cannot pass from the heated filament (cathode) of a rectifier bulb when alternations of the current place a positive charge on the filament and a negative charge on the plate (anode). The electrons, being repelled by the plate, merely cluster about the filament as a space charge. B. But when the current reverses, the electrons stream across the gap to the plate which, being positively charged, attracts them.

Electrons emitted by the cathode (filament) continually bombarded atoms of argon gas, knocking out vast numbers of electrons from them. Now, an atom thus divested of some of its electrons becomes a positively-charged particle called an *ion*. Each ion wanders about until it finds electrons to capture, thus turning itself back into a neutral atom.

Operating Characteristics

When the bulb is actually operating, the electrons from gas atoms as well as many of the electrons emitted from the cathodes (filament) are drawn to the positively-charged anode, where they appear as plate current. Many of the positively-charged gas ions, drawn to the negatively-charged cathode, move in the other direction and regain new electrons from the cloud of electrons coming out of the filament. The main stream of electrons (electric current) accordingly moves from the hot, electron-emitting filament to the non-emitting plate (anode). The rectifying action of the bulb depends wholly on this uni-directional flow of electrons from cathode to anode.

If, however, the filament-circuit is disconnected while current is being taken from the plate, the loss of "space charge" (a name for the cloud of electrons sent out from the filament by heat) permits a sudden torrent of positive gas ions to rush upon the negatively-charged *unheated* filament and bombard its specially prepared surface. The action is so violent that a momentary surge of reverse current may flow from the anode to the cathode.

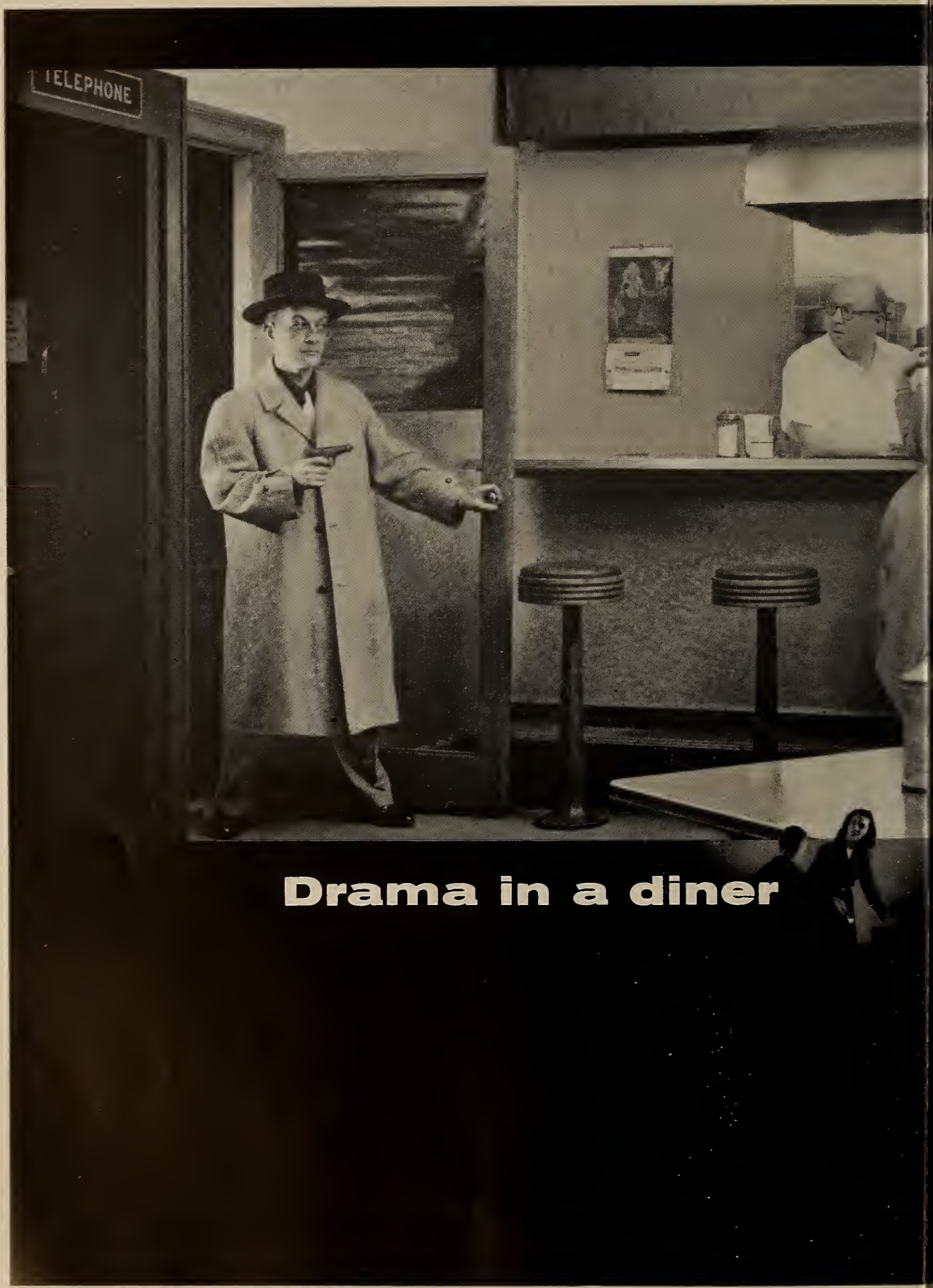
The result of this electronic "explosion" is partial destruction of the electron-emitting powers of the filament and impairment of the rectifying action of the bulb. While this damage may sometimes be corrected by applying excessive voltage to the filament for a short period of time, a rejuvenated bulb is seldom as good as a new one.

It should always be kept in mind, therefore, that the plate circuit must never be closed (that is, "load" must never be applied) unless the filament is heated to full operating temperature.

Under-Volting a Grave Mistake

These facts have an important bearing upon the practical operation of bulb rectifier units. Some projectionists, knowing that the life of an ordinary incandescent bulb may be prolonged enormously by under-volting it (that is,

(Continued on page 31)



Drama in a diner



cause-and-effect in an eye-span

TODAY wide-angle, big-screen entertainment compresses whole chains of events into the sight span of the human eye . . . offers, thereby, greater scope for producer and director—better entertainment for the audience. This has meant new problems, of course . . . new problems in production, processing and projection . . . problems which the Eastman Technical Service for Motion Picture Film is daily helping the industry to solve. Branches at strategic centers. Inquiries invited.

Address: Motion Picture Film Department

EASTMAN KODAK COMPANY, Rochester 4, N.Y.

East Coast Division	*Midwest Division*	*West Coast Division*
342 Madison Avenue	137 North Wabash Avenue	6706 Santa Monica Blvd.
New York 17, N.Y.	Chicago 2, Illinois	Hollywood 38, California



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In The SPOTLIGHT



Earl McClintock (right), business representative for Projectionists Local 262, Mantreal, Canada, presents a gald life membership card ta Lester B. Isaac, national director of exhibition far Cinerama. McClintock is chief prajectianist at the Imperial Theatre in Mantreal where "This is Cinerama" is naw being shawn.

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

PROMULGATION by Otis M. Whitney, commissioner of public safety for the Commonwealth of Massachusetts, which made official, as of April 21 last, an amendment to the rules and regulations "governing the use of cinematographic and similar appartus for the exhibition of motion pictures,":

"In the exhibition of motion pictures. no nitrate film shall be used. All film shall be acetate film, known as safety film. Every motion picture machine shall be equipped with a dowser handle and control switch operated from either side of the machine. While exhibiting motion pictures, the operator shall devote *his entire time and attention to that work.*

In any theatre where the equipment in the booth meets these requirements, and is approved by an inspector, only one operator will be required, otherwise two operators shall be in attendance during the exhibition of motion pictures."

Immediately upon receipt of this exchequer-gladdening news, the president of Independent Exhibitors of New England sounded off as follows:

"It has been a long up-hill battle by the exhibitors . . . to have this burdensome regulation requiring two men . . . lifted. A lion's share of the victory is credited to . . . former president Irving A. Issacs."

Now, this great "victory" was achieved by a group of employers banded together (just like the organized projectionist craft) to promote their own economic welfare. Combines by employers, however, are in the "public interest" — that is, of the "haves" — while any combine of the "have nots" in the form of a Labor Union is inimical to the public welfare—says they.

IP poses just two questions for Commissioner Whitney:

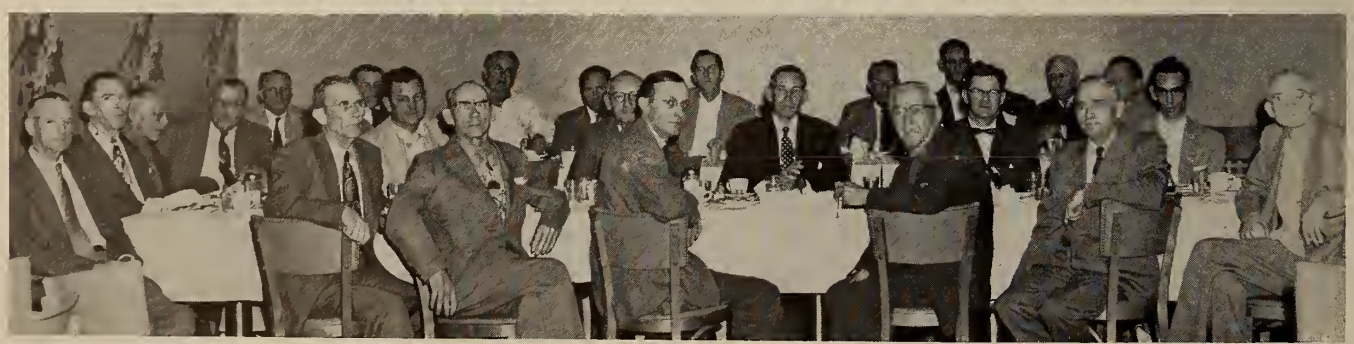
1. If a projectionist devoted "his entire time and attention" to the exhibition of motion pictures, what wraith will swoop down into the projection room and perform those chores which are a must *before*, *during*, and *after* the projection of such pictures?

2. Why the insistence upon a "dowser handle and control switch operated from *either* side of the machine" when it is manifestly impossible for the projectionist to be at other than *one* side if he is to observe both the wording and spirit of the regulation as promulgated?

When the Commissioner digests this frankfurter and lets IP have the benefit of his sagacity (not to mention a touch of magic), we have a couple of more pertinent inquiries bearing on this self-contradictory ruling.

● The 25-30 Club of New York City has asked IP to communicate to the projectionist craft at large its deep appreciation to The Strong Electric Corp., National Theatre Supply Co., and all those who contributed in any

THEATRE OWNERS IN WACO, TEXAS, PRESENTED WITH HONORARY LIFE MEMBERSHIPS IN IA PROJECTIONISTS' LOCAL 597.



Friendly labar-management relations were exemplified in the recent award to five matian picture theatre awners of hanorary membership cards in Lacal 597, Waco, Texas. The presentatians were made last manth at a breakfast party held at the Elite Cafe in Waca. The hanared guests—W. S. McLemare, awner af the Melrose Theatre; Carl Lemke, Crystal Theatre; Ed Newman, Oaklawn Drive-In, Westview, Orpheum, Rex, and Imperial Theatres; and E. C. Houck, awner af the Jay Drive-In Theatre—are shawn above, secand, third, faurth, and fifth fram extreme left. The fifth exhibitar, Abe Levy, af the Rivoli and Strand Theatres, was unable to be present. Also shown are the fallowing members of the Waca Lacal: H. F. Dunn, J. G. Daniels, A. M. Pudig, Hugh Yapp, C. J. Keeler, R. J. Machu, Ray J. Morrow, F. G. Knight, Bert Blantan, H. C. Yapp, Jerry Gage, W. C. Davis, C. L. Holt, E. O. Andersan, and J. F. Harne.

HARTFORD LOCAL 486 AWARDS GOLD LIFE MEMBERSHIP CARD TO CHARLES S. NORTH



Seen above are some of the guests at the recent surprise party Hartford Local 486 tendered in honor of its business representative Charles S. North. Left to right: Peter J. DeCarli, recording-secretary treasurer of the Local; William C. Scanlan, IA trustee; North; Gustav L. Soderberg, president of 486; IA President Richard F. Walsh, who made the presentation; D. I. MacDonnell, financial-corresponding secretary for Local 486; and Walter F. Diehl, IA representative.

degree to the first public lecture-demonstration of the improved Strong "135" arclamp at the April meeting of the Club. Particular thanks is due to Arthur J. Hatch, vice-president in charge of engineering, and Arthur Brown, field engineer, of The Strong Elec. Corp., no less than to Allan Smith, New York City manager for National Theatre Supply, for their efforts in making this meeting an outstanding success.

● *Out-of-Town Visitors to IP Offices:* H. N. (Doc) Elliott, Toronto Local 173, who dropped in to discuss audio-visual technical matters in general; George Raaflaub, secretary of Syracuse Local 376 and president of the N. Y. State Ass'n of Motion Picture Projectionists; and Neil Bishop, Chicago Local 110, whom we wished bon voyage as he and Mrs. Bishop sailed for Europe.

● The California District Court of Appeals recently upheld an arbitration award denying the claims by Southside Theatres, Inc., of Los Angeles, that IA Local 150 violated its contract by demanding the employment of two projectionists for the showing of 3-D pictures. About a year ago Judge Praeger of the Superior Court handed down a ruling vacating the arbitration award originally granted in favor of the union.

● The first nation-wide labor agreement covering employes in the closed-circuit Tv industry was recently concluded between the IATSE and TNT (Theatre Network Television, Inc.), with the signing of a one-year contract. This contract covers operations in all localities in the United States and Canada where TNT televises closed-circuit programs. TNT already has a 41-city network of large-screen projectors, mobile within each area, which will be operated by IA men.

The first telecast under the new contract took place on May 9, when a network of 35 cities carried a special program for doctors, sponsored jointly by the American Medical Association and the Smith, Kline and French Laboratories.

Commenting on the contract, IA President Walsh stated that "the agreement is an important milestone in the progress of an industry which has a tremendous potential in the fields of entertainment and communications. It signalizes the acceptance of the network concept of complete facilities and service as the best means of developing and maintaining the highest technical standards through the use of skilled IA personnel."

Nathan L. Halpern, president of TNT, expressed his satisfaction with the outcome of the negotiations and declared that "good labor relations have been basic to every successful business in the communications field. TNT is happy to have established a stable labor structure for the closed-circuit Tv industry."

International Representative John J. Francavilla, represented the IA in the negotiations.

● Rounding out 48 years in show business, Cecil C. Franklin, veteran member of Local 233, Buffalo, N. Y., retired on April 15 last from his job as projectionist at Shea's Buffalo Theatre. He plans to spend the next year traveling with Mrs. Franklin—a long-cherished dream.

Franklin worked at the Buffalo Theatre for the past 27 years—from



Cecil C. Franklin, retired member of Buffalo Local 233.

August 1928 to April 1955—and prior to that at Loew's State Theatre in Buffalo until it closed in 1928. He has been an IA man since 1910, and has

(Continued on page 30)

SEEN AT 25-30 CLUB LECTURE-DEMONSTRATION OF STRONG "135" PROJECTION LAMP



Left to right: Ben Stern, treasurer; Sidney Wein, sgt.-at-arms; Joe Perlman, trustee; Allan G. Smith, hon. member and manager of N. Y. branch of National Theatre Supply; Morris Rotker, past president; Tony Boscarelli, vice-president (Local 384, Hudson County, N. J.); Morris Klapholz, recording secretary; Julius Wetzler, trustee; Arthur J. Hatch, vice-president, and Arthur Brown, field engineer, of The Strong Electric Corp., and Jack Winick, president of the Club.

Video-Film Camera

By AL SIMON

Production Supervisor, MacCadden Corp., Hollywood

New duol-purpose comero which will photogroph simultaneously o show for "live" Tv ond record it on film is described by o pioneer of filmed Tv shows. Probobilities, not possibilities, ore enumeroted herein os originally presented by our esteemed contemporary, AMERICAN CINEMATOGRAPHER.

Allied Arts And Sciences

There is a vast field of scientific endeavor which is directly contributory to motion picture production and, therefore, to the projection process. The projection craftsman should have a well-rounded understanding of these contributory factors.

THE WEDDING of electronics and film in a single dual-purpose video-film camera was inevitable. When shooting my first Tv show on film in May, 1951, I saw the advantages such a camera offered: the ability to televise a show "live" and at the same time record it on motion picture film for delayed broadcast; also, the arrangement would make possible a practical electronic view-finder, enabling the cameraman and others to see the scene *exactly* as it is being picked up by the camera lens.

It would also make possible for the first time the use of "slave" monitors in filming shows with multiple cameras, permitting the director to observe the coverage of each camera from a remote position.

Unaware of the complexities of optics or of the continuing rapid advancement of electronics, I nevertheless ventured into the design and production of such a camera. The ensuing four years were filled with many anxious moments. Today, the video-film camera as envisioned is a reality.

Camera Capabilities

This camera is capable of transmitting a "live" image *via* television and at the same time recording the same image on 35-mm motion picture film—both images identical in field because both are picked up by *one and the same lens!*

It works this way: an image is picked up by the camera by means of a regular photographic lens which transmits it to the film plane in the usual manner. Between the lens and the film a beam-splitter is interposed which causes a duplicate image to be picked up by the vidicon tube of the electronic side of the camera. The "camera" is actually two-in-one: a film camera and a complete Tv camera.

Uniting the two types of cameras in a single unit made possible the electronic view-finder, with outlets for a number of remote monitors, which cameramen have long hoped for. The electronic finder eliminates entirely the old parallax problem because the image seen on the finder screen is *exactly* that which is recorded on the film and by the Tv pickup tube.

A blimp, 18 x 21 x 21 inches, houses the motion picture camera, electronic components, view-finder and vidicon pickup camera. A cable extends to a master monitor having a 10-inch screen. Additional monitors may be connected at any time. Swinging the various lenses into place is accomplished as easily as with Tv cameras.

Simple Preparatory Steps

Film loading requires only two steps: opening cover of the blimp (to which is attached the electronic finder tube) exposes the film magazines; by depressing a catch, the electronic camera unit swings out of the way, affording access to the film movement, gate, main sprocket and film-retaining rollers.



The functions of o television camero ond o film comera ore combined in this new video-film comero, which picks up ond tronsmits o television show ot the some time it records the show on film—on oll-purpose tele-film comero.

When we originally set up the multiple film camera operation, our purpose was to utilize film cameras in the same manner as "live" Tv cameras were being employed at that time—with the camera operators and the grips instructed *via* intercom phone system by the director. A drawback to this system, however, is that the director, usually located in a remote booth on the stage, cannot see *exactly* what each camera is recording.

Errors Immediately Corrected

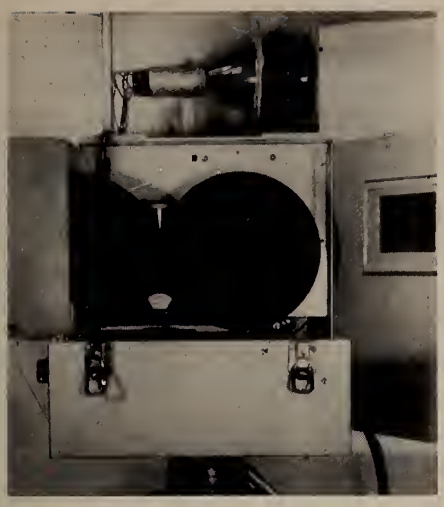
Using our new dual cameras, the director of the show as well as the director of photography can see, on their *remote* monitors, that which each camera is picking up. When errors occur, they can be observed immediately the action takes place instead of having to wait until the "dailies" are printed.

A feature receiving serious consideration is the addition of a cueing device in the camera so that when two or more cameras are used in recording a show the various cameras can be cut in and out, making it possible to edit to some extent the production as it is being shot in the manner that **"live"** Tv shows are presently "edited."

All-Personnel Constant Check

Still another technical advantage of this dual camera is the ability of the camera operator to keep a constant check on focus. There is no need to rack over and check focus after each take, because the focus quality as seen in the electronic finder corresponds exactly with that of the image reaching the film.

Use of remote monitors with the camera opens up new possibilities for the cameraman as well as the director when dolly or boom shots are being photographed or in the filming of miniatures. Instead of riding the



Looking inside the comero. Here, one unit of sectionol door of blimp, which is roised, is shown supporting the electronic finder tube. In lowered position it comes to rest before the operture on door ot right. Film mogozine is reodily accessible. Door section just below mogozine is lowered to give occess to comera mechanism for threoding.

boom or dolly for critical observation of camera coverage, what the camera records may be seen more conveniently on the remote monitor, which may be located any place near the set.

Even the sponsors of Tv commercials stand to gain when this new camera is employed in shooting advertising spot announcements. The remote monitor will enable them to see the commercial exactly as it will appear on film, *as it is being filmed.* Any changes or corrections that appear necessary may then be made on the spot.

Dual-Purpose Light Level

One of the more important engineering problems encountered was that of insuring that the image recorded by both the film and the electronic camera units would reach each instrument at the required light level. For example, if a given scene is shot with illumination of 200 foot-candles at a stop of *F*:4, the exposure will be the norm for *both* the film camera and the electronic camera without need for any compensating adjustments.

In the course of tests made by Phil Tannura, A.S.C., each of the three lenses on the camera turret were shifted into taking position during the filming of a sequence—each set at the same *F* stop.

"In comparing the results with footage shot earlier that day on the same show with conventional cameras," said Tannura, "the only difference noted was that the dual-camera negative required a printer-light adjustment of two points during printing. On the screen, there was no observable difference in quality. The test footage was shot with the 40-, 50-, and 75-mm lenses."

The advantages of this new, two-purpose camera appear almost endless as one continues to examine its potentials. Used solely as a motion picture camera, it can effect tremendous production economies by speeding up operation on sets, since each take is observable on the monitors by directing personnel.

Tremendous Economies Envisaged

Used in a multiple-camera Tv film show, the economies would be tremendous. It isn't hard to foresee the video-film camera eventually replacing the image orthicon Tv cameras presently in use, because with this camera it will be possible to make first-class film records of a show, replacing kinescopes. Where the camera is employed on Tv "spectaculars," there will be recorded simultaneously a first-quality color motion picture negative from which excellent prints can be made for subsequent telecasting.

With only slight modification, the camera may be employed to transmit a "live" Tv show in full color, at the same time recording the show on color film. Since at present there is no practical way for a color kinescope to be made (and there may not be in the foreseeable future) this camera easily solves the problem of obtaining a simultaneous record of color Tv shows.

When and if practical video tape recording is developed and employed in the production of Tv films, the video-film camera will be a natural for recording such programs for pickup and transmission to the tape recorder, at the same time providing a film record of the program, too.

Motio's Water-Cooled Gate, Aperture Blower

By Fred C. Matthews

Motiograph, Inc.

SEVERAL years ago a number of manufacturers of projectors and arclamps expressed their views in the columns of IP on the merits of the various methods of cooling film in the projector gate. At that time the writer expressed the opinion that the best way to achieve the desired end was to use a combination of a water-cooled film gate and an aperture-cooling blower. Today Motiograph AAA projectors are equipped with both.

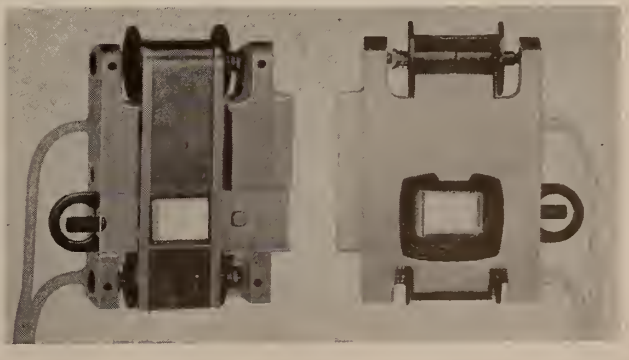
The demand for greater screen illumination has made the problem of heat on film an even greater problem than the one which existed just a few years ago. Arclamp manufacturers are making lamps to operate at higher amperages, and projector manufacturers have increased the size of the openings of their heat shields and decreased the width of their shutter blades; more light pours on the film and, consequently, more heat is also present there.

Water Plus Air-Cooling

The use of water-cooled film gates and aperture-cooling blowers, in my opinion, is still the best answer to cooling film, but it is not the complete answer—some of the heat from the arc must be dissipated before it reaches the aperture.

We recommend first that the arclamp ventilation system be equipped with a fan capable of drawing air at the rate of at least 500 cubic feet per minute. We also urge that the arclamps be equipped with fans to aid in the dissipation of heat.

Our tests of the efficiency of the



THE MOTIOGRAPH WATER-COOLED GATE

Left: film-side view of the gate showing guide rollers top and bottom. Right: rear view of the Motiograph gate.

new Motiograph AAA water-cooled film gate and the AAA aperture-cooling blower were made using lamps equipped with an internal blower. The arclamp ventilating system was equipped with a fan exhausting air at the rate of 500 cubic feet per minute. We feel that without such auxiliary equipment the results of our tests would not have been anywhere near as good as those shown.

No Filter Employed

A series of tests were made on a Motiograph AAA projector equipped with 52-degree shutter blades, the AAA water-cooled gate and the Motiograph aperture cooling blower used in conjunction with a high-intensity reflector-type arclamp with a rotating positive carbon mechanism operating at 135 amperes. *No filter was employed.*

These tests proved conclusively that the film did not buckle even when run for four consecutive 20-minute periods.

Wide Temperature Contrast

An important supplementary result of the tests was the fact that our projectionist, Charles Vonesh, IA Local 110, could immediately rethread without fear of burning his fingers because the gate temperature was only 5 degrees above room temperature. Without water cooling, gate temperature was 190 degrees.

Water-cooled gates and blowers are available as an attachment for Motiograph AA and AAA mechanisms, and may be readily installed by projectionists.



Showing Wide Pictures via. Rear Projection?

To the Editor of IP:

For many years I have found IP of very great assistance; I congratulate you on maintaining a high technical standard.

Do you have any intention of discussing the problems of C'Scope and other wide-screen presentations via. the medium of rear projection? I realize that rear projection using Trans-Lux lenses is not of widespread interest, but those of us who are faced with the new techniques and are handicapped hy having rear projection would welcome any information on this topic—something which seems impossihle to ohtain.

Thank you again for your fine standard of service to the industry throughout the world.

E. POUTNEY
Newsluxe Theatre, Sydney, Australia

EDITOR'S REPLY: The rear projection of wide-screen and CinemaScope films has been unsatisfactory on account of light-distribution and focusing difficulties. The transmission characteristics of translucent rear-projection screens make it exceedingly difficult to obtain adequate illumination on the sides of the screen when films are shown by the wide-screen and CinemaScope techniques.

Practically all American theatres which formerly employed rear projection are reconverting to standard front projection on reflective screens. The conversion involves relocation of the projection room and other costly changes, but is regarded as an inescapable necessity for the presentation of CinemaScope and other wide-screen films.

Idea is Practically Hopeless

Since practically all theatres using rear projection are of an intimate character as to width and length, with a correspondingly small stage opening, IP feels that such structural characteristics alone render it useless to even speculate upon wide-screen processes—unless, and this is the old, old story—one wishes to spend great gobs of money to push the walls out or even to build and equip a new front-throw projection room.

Penthouse Heads Scratch Film

To the Editor of IP:

So far I've not seen or heard anyone touch on one of our higgest headaches since CinemaScope howed. This theatre has enjoyed full stereophonic sound for the past year now, and I believe we've played about all of the C'Scope pictures. By now I've become convinced that there will he no remedy for our headaches until the present penthouses are redesigned.

Believe it or leave it, this show shop has hy this time not yet played a four-track print *without* scratches. I'm not trying to he an alarmist, hut since "The Robe" there's heen hardly any C'Scope film which was not scratched—and badly. We used these prints (what could we do?) hut the four-track pictures simply cannot compete with the other squeezed prints, notably Superscope, the first two of which were clean and without scratches. Superscope, of course, is optical track, therehy not touching the penthouse rollers.

All film going through the penthouse reproducer sure catches hell. Have a good look, fellows, at these C'Scope prints, and I'm sure you'll agree with me.

AL KUIPER
Terrace Theatre, Minneapolis, Minn.

EDITOR'S REPLY: It is true that contact of magnetic-track CinemaScope film with the tension rollers, impedance drums, and magnetic pickup heads of penthouse reproducers greatly increases the number of scratches inflicted on prints during projection. Rollers which contact the entire surface of the film are responsible for most of the damage, especially if they do not pick up speed quickly and if they fail to revolve freely.

Need Film-Guiding Rollers

Scratches and burrs on the film-contacting surfaces of such rollers abrade the film severely. Even gritty particles of dirt adhering to the rollers cause a multitude of fine scratches which have the appearance of "rain" on the screen.

The failure to provide certain film-guiding rollers in a few makes of penthouse soundheads allows film which is threaded to bypass the magnetic reproducer to rub against the edges of the holes in the fire-valve box and the top of the projection mechanism. This has become a serious cause of deep lengthwise scratches in optical-track prints shown in theatres equipped for playing magnetic-track CinemaScope prints. [This source of film damage was discussed by Henry B. Sellwood in the January 1955 issue of IP—"Film Damage on the Increase," page 14.]

Optical Track Upswing

There is a definite trend toward the use of Perspecta sound optical-track reproduction as a satisfactory and comparatively inexpensive substitute for multi-track magnetic reproduction when stereophonic effects are desired. At the present time all producers with the single exception of 20th-Fox are using optical sound exclusively. With the decision to play only optical sound tracks, penthouse soundheads should be removed from the projectors in order to prevent unnecessary film damage.

More of the Same Herein

To the Editor of IP:

I find IP extremely interesting these days, especially since CinemaScope. Your charts on lenses, apertures, ratios, etc., are very useful hecause one cannot keep all that information in one's head.

PERCY WRIGHT
Secretary, IA Local 467
Port Arthur, Ont., Canada

EDITOR'S REPLY: Thanks, Mr. Wright; but just get a load of the honey of a chart in this issue (in the article by R. A. Mitchell on 'Matching' Apertures and Lenses). More of these charts to come.

What Do You Know About Carbons?

The first of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data provided by National Carbon Company.

What is Carbon?

Carbon is an element found in abundance in all parts of the world since it it a constituent of all organic materials. The most perfect crystalline form of carbon is the diamond, and even the diamond is excelled in purity by special carbon and graphite electrodes manufactured for use in spectroscopic analysis.

Other well-known forms of essentially pure carbon are graphite, lampblack, charcoal and coke. The latter forms, however, usually contain some mineral or volatile impurities. Coal contains a very high percentage of carbon as well as a variety of tarry hydrocarbons from which the numerous coal-tar products are derived.

What are the Chemical Characteristics of Carbon?

From a chemical standpoint, carbon is very inactive, resisting the effects of most acids, alkalies and solvents. It does not melt at any incandescent temperature, remaining a solid up to about 3670°C. (6640°F.), and then going directly to a vapor without an intervening liquid phase.

It may readily be formed in a variety of shapes, either in the initial plastic condition or later by machining in solid form. In graphite form, carbon is valuable as a lubricant. The thermal conductivity of carbon in non-graphitic form is low as compared with that of most metals; but in graphitic form it is higher than that of most metals.

Although higher in electrical resistance than the metals, carbon is nevertheless a good conductor of electricity, a characteristic adapting it to many uses in the electrical field.

What are some of the Industrial Applications of Carbon?

Various industrial applications of carbon include carbon brushes for motors and generators; welding carbon products; carbon and graphite anodes and electrodes used in electrochemical and electrometallurgical industries; carbon Raschig rings, carbon and graphite tubes and carbon linings, "Karbate" impervious carbon and graphite for heat exchangers and other applications for handling and processing acids and other corrosive materials.

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applications among which are switch and circuit-breaker contacts, resistance discs, steam turbine packing, piston rings, stuffing box packing, thrust rings for automobile clutches, ingot mold plugs and stools, back plates, diaphragms and granular carbon for telephones, electronic tube anodes and grids and, in the form of pure graphite powder, as a lubricant and a constituent of lubricating greases.

What Stresses Must a Projector Carbon be Able to Withstand?

The demands made upon projector carbons are extremely severe and their present high quality has only been attained by painstaking research and years of manufacturing experience. Great care is necessary in selecting raw materials of unusually high purity and in maintaining close control over every step in the six to eight weeks period of production.

Projector carbons must conduct electricity at very high current densities, ranging from 140 to over 1500 amperes per square inch. They must permit the attainment of a very high concentration of energy in the gas ball confined within the positive crater, at the same time supplying material through volatilization of light. No material other than carbon can satisfy these requirements—with the cup-shaped crater surrounding a ball of fire at a temperature in excess of 10,000°F. and with the carbons gripped only a few inches away by metal jaws, the temperature of which cannot safely exceed 2,000°F.

Constant research is necessary to produce new types of projector carbons and means of utilizing them which will meet or anticipate the demands created by the steady development of the motion picture industry.

What was the First Commercial application of Carbon?

The first commercial application of carbon on an extensive scale was in the electric arc lamp. Here the singular characteristics of this element make possible a quality and intensity of illumination which cannot be obtained in any other way. Possessing good electrical conductivity and low thermal conductivity, non-melting and slow burning at the extreme temperature of the arc, remaining a firm solid at a temperature higher than that attainable by any other substance of suitable electrical conductivity, carbon has proved to be the ideal electrode material for this purpose.

Although the carbon arc lamp is no longer used for *general* illumination, its importance has not diminished. The development of new types of carbons for special applications has greatly extended its use into fields where it has shown marked superiority over other sources of illumination. In the home—as well as in hospitals and sanatoria—the carbon arc is used to produce artificial sunlight and radiation of specialized character which physicians practicing light therapy have found valuable in the prevention and cure of certain physical disorders.

Graphic Arts Applications

The carbon arc has become an important tool of industry for processing materials by means of photo-chemical reactions and for accelerated tests of materials which tend to deteriorate under the action of sunlight. The most powerful searchlights utilize highly developed types of carbon arc lamps with carbons designed for this specific purpose. Thousands of carbon arcs are in daily use in photography, photo-engraving, blue-printing, and allied industrial processes.

The motion picture industry would never have reached and could not maintain its present high plane without the aid of the carbon arc which is used both for studio illumination and for projection. The large screen, long throw, and high level of screen illumination in the modern theatre require an intensity in the light source that only the carbon arc can suply. The brightness of the crater may be as much as seven million times the brilliancy of the screen, unequalled by any other source.

That Old Refrain—Just Try To Focus

Here is a common complaint about the poor photographic quality of present theatre release prints—features, shorts, newsreels, whether in black-and-white or color—which makes it practically impossible for projectionists to maintain any acceptable degree of focus. The contributor of these observations is MORRIS KLAPHOLZ, veteran projectionist of IA Local 306, N. Y. City, and official of the 25-30 Club. Comment from the field is invited.

WHY DO film exchanges (or is it the labs?) add about eight frames of leader just prior to the censor's license number at the end of a film? This leader is blank, of course, but why must there be framelines all the way across this section of film? Haven't they ever heard the "motor boat" sound that results?

That isn't all. They insert this strip smack in the middle of the closing music. One has to run all of the license number and then continue with the music again. Is this showmanship?

Recommended Procedure

Here's what I do about it: when I examine the film prior to showing, I cut out this strip entirely and then re-attach the end of the closing music so as to have the proper continuity; *then* I re-attach the license number — but without the strip of blank leader. If the exchange does not like this, I am sorry, but that is the way the film runs in my theatre.

Another gripe. Who is responsible for the horrible focus in present-day films? I'm going blind trying to focus many pictures, and so are my partners. We had a sharper picture 40 years ago — and I mean it!

Improvements for Naught

Today we have faster lenses, better light, better screens, better everything, yet the focus is horrible. Some directors and cameramen are obviously daffy about a "soft" (?) focus. Or are they looking for some other uncanny effect?

The customers complain to the manager, the manager complains to us and we both get short-tempered. This is what happens practically all the time, although I can't say it about my house because our manager is one of those rare fellows who has an appreciation for things technical. Even the newsreels have the worst photography I've witnessed in almost 47 years as a projectionist.

PROJECTIONISTS and movie audiences in areas where no censor seals are required are certainly lucky. License seals having framelines that cross the soundtrack are even worse than the scribblings we sometimes find in the track area of replacement leaders. The only cure is heroic wielding of the scissors.

Another nasty trick is the punching of letters and numbers in titles. If we leave the mutilated film in the reel, the result is a rain of dots on the screen. If we cut them out, the music skips a beat. The proper place for all this claptrap, including censor seals, is at the very end of the leader or runout tail. No one wants or needs whatever dubious information may be conveyed by those wretched inserts and punch-marks.

Release Print at Fault

Naturally, the projectionist is blamed for fuzzy focus by people who don't realize that the screen image can be no clearer than the picture on the film. Wide screens and short-focus lenses deserve part of the blame, but the root of the trouble *definitely lies in the release print*. Mr. Klapholz is 100% correct

when he says that the prints made 40 years ago were clearer and sharper than the average print of today. The silent movies filmed in the 1920's have never been surpassed focus-wise, being sharp from corner to corner. What happens?

The older movies were made by men who were craftsmen above all else. They had a feeling for pictorial quality which is exceedingly rare these days. Negatives, master positives, and dupes were developed by hand and evaluated by visual inspection.

All processing is now handled by machines, and the necessary changes in density from scene to scene are made on the basis of the required development gamma for the soundtrack. Attention is now applied in print control to the densitometric test strips at the beginning and end of each reel. Seldom, and only in the better laboratories, does anyone ever examine the picture itself.

The Speed-Up Technique

There is plenty of sloppy camera work in present-day releases (the speed-up technique). Much of this may be due to the fact that the average cameraman *of* today is the operator of a motor-driven machine. Set lighting and camera angles have become astonishingly stereotyped, and negative footage is ground out on a mass-production basis.

No one dares to experiment in a commercial movie studio. With the "creative efforts" of the average cameraman limited to pointing the camera at a conventionally lighted set and pressing a button, it is no wonder that the matter of lenses and focus for the best possible pictorial results is often ignored. A few cameramen, most of them old-timers, have enough influence with producers to get away with first-class camera work.

There is no doubt whatever that good negatives are sabotaged in the processing laboratory. Deterioration of the image usually begins with the printing of masters and dupes, especially when optical printing is used. Soiled and improperly focused printer lenses produce blurred images that continue down the line to the final prints. In a few cases we have found dupe negatives made from positives which, in turn, were printed from dupes!

A few of the largest labs are still using obsolete sprocket printers for contact-printing release positives. Not only are these machines obsolete, but they are operated at tremendously high speeds to enable release schedules to be met. Faulty contact of the dupe negative with the positive raw stock blurs the picture, as does also any slippage between the two films. In some cases these antique printers are adjusted for shrunken nitrate negatives, not for the unshrunken safety-film dupes which are being used. It all adds up to the old, old story of wornout and inadequate equipment.



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Oops! Says IP on Lens-Cleaning Data

On page 24 of IP for last month (April) there appeared a bold-face box under the heading "Lens-Cleaning Rules" which is incorrect in one very important particular. IP's technological felony was compounded by a supplementary line stating "Post These Rules for Ready Reference." If our IP stalwarts have posted this box, get rid of it — quickly! Appended is a communication from Mr. Joseph A. Featherston, Kollmorgen Optical Co., who, apart from being horror-stricken at Rule 2 in the aforementioned presentation, provides additional useful data relative to modern lenses:

Mindful of IP's unswerving devotion to the very best in technological procedure, we offer the following commentary relative to the item headed "Lens-Cleaning Procedure" on page 24 of your last (April) issue.

NEVER *under any circumstances* should water or soap or any detergent be used to clean a projection lens!

Kollmorgen instructions for the cleaning of lenses have been practiced since 1948, and we have had no negative comments. We get lenses in for reconditioning which evidence that powders have been used in the cleaning process, with the result that the lens coating, especially on the outside of the rear element, has practically been removed.

We feel that solvents are more advantageous as a cleaning agent than water, soap and water, or detergents and water, because they dissolve oily residue more readily. Also, solvents evaporate, while water must be dried off. We specify lens tissue because it was found impossible to accurately describe just what constituted "clean cotton cloth" or "well-washed" linen. These terms are very misleading and induce much trouble.

General Terms Misleading

Another problem in recommending soap as a cleaning agent was to specify *exactly* what is meant by a "*weak soap solution.*" In "*hard water*" areas considerably more soap would have to be used than in "*soft water*" areas. The soap must be removed with distilled water, or layers will form and become baked by the heat of the arclamp. The only possible way to remove such a deposit would be by volatile solvents.

In repairs, we have found that the rear gasket seldom shows any disintegration, regardless of what method of cleaning was employed.

No matter what the method of cleaning, the lens coating, especially on the rear element, will eventually wear off. Kollmorgen has a standard reconditioning job that consists of repolishing and recoating this element, cleaning, adjustment and resealing. Such a job, if it is done every two or three years, will, we believe, maintain the lenses in excellent condition.

Theatre Tv Gaining Slowly

Continuing expansion of the theatre Tv field is indicated by contracts from 85 theatres throughout the country which showed the Marciano-Cockell heavyweight championship fight in San Francisco on May 16.

Theatre Tv is still handicapped, however, by the limited number of saleable attractions available for programming. General Precision Labs, manufacturer of theatre Tv projection equipment, announced that sales of this equipment during 1954, while not large, had been the best of any year so far, and also noted that box-office receipts for such programs during 1954 had improved. GPL, however, does not expect any substantial increase in equipment sales until more theatre Tv entertainment is available.

PERSONAL NOTES

PHILIP GRUEN, veteran field engineer attached to Altec Service Corp.'s northeastern division in the New England area, died suddenly on April 21. Gruen entered the service field in 1929 under

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the ERPI banner, joining Altec in 1937. He leaves a widow, Mrs. Frances Gruen, and a daughter.

BERNARD SHOLTZ, for the past 25 years with RCA in the Eastern equipment field, has been named vice-president in charge of sales for NORPAT SALES, INC., 113 West 42nd St., N. Y. City. Prior to his RCA post, "Barney," as he is known far and wide in equipment circles, spent many years as a film salesman, thus he has cemented a host of exhibitor friendships. Norpat carries a full line of theatre equipment.

E. ARTHUR HUNGERFORD, JR., formerly manager of the Tv department of General Precision Labs., has been named executive director of the Metropolitan N. Y. Educational Tv Assoc., responsible for the development activities in building an educational Tv station.

FENNER G. HEADLEY, until now motion picture finishing supervisor for the Du Pont Co.'s photo products plant at Parlin, N. J., has been named motion picture sales supervisor for the New York district. He succeeds NORMAN F. OAKLEY, a veteran of nearly 40 years service with the company, who becomes special advisor on motion pictures sales in the district. Oakley has long been a close associate of cameramen, projectionists and other members of the organized crafts.

OBITUARY

HORACE B. JOHNS, 60, business representative of Philadelphia Local 307 for the past 25 years, died April 20 last. He was formerly chief projectionist at the Boyd Theatre. A member since 1913, Mr. Johns served on the executive board and represented Local 307 at every IA Convention since 1930. He was a member of the Masonic Order. Survivors are his wife, a son, three sisters and two grandchildren.

GEORGE THIBODEAU, member of Local 195, Manchester, N. H., succumbed last month to a long illness. He worked as projectionist for many years in and around Manchester.

EDWARD F. LAVERY, 64, member of IA Local 277, Bridgeport, Conn., succumbed to a heart attack on March 25 last. A member of the Local since 1916, he worked as a projectionist at Loew's Poli Theatre for the past 28 years. Born in Bridgeport, Edward Lavery was a life-long resident there. He was a staunch unionist, always ready to serve his Local for the best interests of the membership. Down through the years he served Local 277 in various official capacities, and was called upon to represent the Union at numerous wage negotiations and controversies. Edward Lavery enjoyed the respect and affection of his brother members, who will always remember him for his unselfish devotion to the welfare of others.

EDWARD J. DOWLING, 55, member of Local 350, Meriden, Conn., died last month after a brief illness. For the past 20 years he worked as projectionist at various theatres in Meriden. Prior to his work as a projectionist, Dowling was a member of the famous Lew Dockstader Minstrels troupe.

ARTHUR POTTER, 70, projectionist at the Six Mile-Uptown Theatre in Highland Park, Mich. died on March 25 last. He was a member of many years standing in Detroit Local 199.

THOMAS IVANS, 65, member of Local 228, Toledo, Ohio, died last month after a short illness. He was a member of the Toledo Local since 1913, and prior to his retirement five years ago, worked as projectionist at the Esquire theatre in Toledo.

N. C. 'Yellow Light' Carbons

National Carbon Co. is now producing carbons for motion picture studio set lighting to provide spectral energy distribution of around 3300° K. which will match the spectral sensitivity of present color films. The new color carbons will require only a very light filter to absorb a slight excess of near ultraviolet. With the addition of this filter over the lamp, carbon arc lamps may be freely mixed with incandescent tungsten on motion picture sets.

This drastic change in color temperature has been obtained without loss of measurable light, which means that the photographically effective illumination from an arclamp will be almost doubled without additional power input. The carbons have passed rigorous tests for both set lighting and process (rear) projection.

The balanced white light of the standard high-intensity carbon arc will still be used for "booster" light on outdoor sets where a sunlight balance is desired.

Canadian Theatre Scene

Canada now has 112 closed film theatres of various types, of which 67 were shuttered during the past year. Obsolescence in both equipment and appointments, no less than other factors such as poor location and changing trading areas, are named as major factors in the closings. On the credit side, there have been opened recently 27 modern indoor theatres and 4 large drive-ins.

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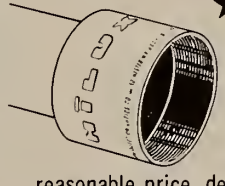
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IN THE SPOTLIGHT

(Continued from page 21)

served on the executive board of Local 233 for 30 years.

Before setting out for foreign lands, the Franklins plan to spend some time visiting their two children—Cecil, Jr., who is on the faculty of the University of Southern Illinois, and their daughter, Jean, who makes her home in Florida.

● We don't have many poet laureates in the projectionist craft—or in any other craft for that matter—but Milford Shields, projectionist at the Kiva Theatre in Durango, Colo., is one of the very few. Last June he was named poet laureate of Colorado, and his latest work, soon to be presented to the State Historical Museum in Denver, is called "Design for a Curtain of Light" and contains poems dedicated to the free nations of the world.

Shields is presently at work on another project—that of designing and advocating a special flag for all the school children of the world. Such a flag, he contends, might be used in case of war to identify all school buildings. In addition to all these enterprises, he is a 32nd degree Mason and



Milford E. Shields

holds a number of offices in the Order. A pretty busy man—in anybody's book.

● Before an assemblage of more than 850 persons, including notables in all branches of the motion picture, radio, and Tv industries, IA President Richard F. Walsh was the honor guest of and received from the Variety Club of New York the Heart Award for conspicuous unceasing effort in behalf of charitable and other community projects.

While Walsh was the honor guest at the affair held in the Grand Ballroom of the Waldorf Astoria Hotel in New York City, he stated flatly in his opening remarks that he regarded himself as merely an instrument in rallying support for charitable enterprises by organized labor, and that the rank-and-file of all participating unions deserved the major share of credit.

"Obviously," continued Walsh, "no individual could accomplish much without the unselfish cooperation of all the members of his organization." This was a reference to the statement by William German, distributor of Eastman film and last year's Award winner, that Walsh will be "the custodian of this Award for the men and women of the more than 900 Local Unions of the IA."

Walsh, who has served as a direc-



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tor of the Variety Club Foundation to Combat Epilepsy since its inception, predicted that this and other dread diseases now lacking a specific cure would be conquered by the same means employed to develop the polio vaccine. He pleaded for continuing support by employers in providing work opportunities for those afflicted with epilepsy and other insidious ailments. Walsh's obviously sincere address moved the large audience at the dinner, and all who heard him agreed that he reflected much credit upon organized labor in general and his own IA organization in particular.

Many IA Locals were represented at the dinner by special tables for their units, and in addition there was a host of individual IA members present, mention of who herein is prevented by space limitations.

● The California State Fair and Exposition and the Sierra Camera Club of Sacramento will hold a joint North American International Exhibit from September 1st through the 15th. Closing date for entries of prints is July 29, and for slides, August 11. Entry blanks may be obtained by writing to the California State Fair and Exposition, P. O. Box 2036, Sacramento, Calif.

In an unanimous opinion by the presiding justice, the Appellate Court reversed the Superior Court ruling and directed confirmation of the arbitration award. The upper Court upheld Local 150's contention that "the arbitrators acted within their powers in undertaking to make a determination as to the scope of the contract" and that the award in favor of the union "would leave it free to insist upon a new or supplemental agreement settling the 3-D picture dispute." The Appellate Court declared that "the demand of the theatre was denied because it was determined that the *contract did not cover 3-D projection.*" That's that.

BULB RECTIFIER ANATOMY

(Continued from page 17)

by burning the filament at a reduced voltage), have mistakenly assumed that the longevity of Tungar-type bulbs is increased by reducing the filament voltage. This has sometimes been done as a means of reducing arc-amperage, as, for example, when a projectionist wishes to decrease his arc-current from 75 to 60 amperes.

Destructive positive-ion bombardment of the filament occurs to some extent whenever filament-temperature is reduced below its normal value *and the impedance of the plate circuit is not correspondingly increased!* Hence, reducing filament-voltage as a method of reducing arc-amperage almost invariably damages rectifier bulbs, shortening their life by decreasing electron-emission and current-output.

Varying Output Current

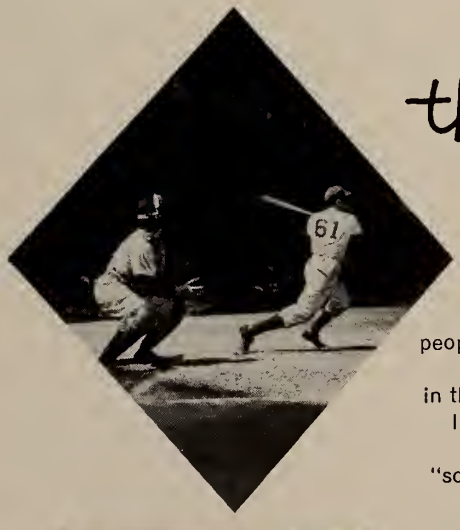
In some cases the output becomes erratic when filament-voltage is reduced; in all cases the development of differences in the outputs of the 2, 4, 6, or 8 bulbs of the rectifying unit causes flicker in the screen illumination.

The method used for varying output current differs in the various makes of tube rectifiers. The best method employs taps on the power secondary winding of the transformer. (Primary taps are intended only for the correction of high or low line-voltage conditions, not for regulating arc-current.) Taps on the power secondary permit the selection of a desired arc amperage without radically affecting the filament-voltage. The filament secondary has no taps.

Filament Voltage vs. Arc Current

If no current-regulating taps or control-knob are provided on the power secondary, and it is desired to decrease arc current, the best and safest method is to insert a suitable ballast rheostat in series with the arc. To repeat, *never reduce filament-voltage to regulate arc current!*

No harm is done to Tungar-type rectifying bulbs by leaving the filaments lighted at times when no load is applied to the plates. As a matter of fact, con-



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tinuous heating of the filaments by the recommended full filament voltage is excellent insurance against destructive back-current effects produced by transformer reactance.

Operating Procedure Elective

If the rectifying units are properly designed and operated, however, it does not matter whether the rectifiers are periodically turned on and off, or left on throughout the whole show. When left on without plate load, no current is consumed except the small amount needed to light the bulb filaments. The transformer will not get hot during the no-load intervals.

Most projectionists prefer to leave both rectifiers on during the show; but others prefer turning each rectifier on only when its output is needed. It matters little which procedure is followed.

By ARTHUR J. HATCH
The Strong Electric Corporation

BEFORE we could give a firm answer to this question we should have to know whether the rectifier tubes are of the argon (Tungar) type or the Mercury type. The reason for this will be evident as follows:

The Mercury type tubes require a preheating time of approximately 3 to 5 minutes before the arc is struck. The practice followed in rectifiers of our design is to make provision so that the filaments of the rectifier tubes are energized as soon as the projectionist enters the room to begin operation for the day, and the filaments are kept on throughout the length of the show.

Continuous vs. Intermittent Duty

Transformers for heating these filaments are usually separate from the plate transformer of the rectifier and are designed for continuous duty operation. This eliminates the need for the projectionist to remember to turn the filaments on 3 to 5 minutes ahead of the time he wishes to strike the arc, and the rectifier is in standby condition at all times.

On the other hand, in the design of Tungar-type rectifiers (with the possible exception of a few that were made a couple years ago for 3-D presentations) these types are designed for intermittent duty, and as the filament requires only 2 or 3 seconds preheating time before the arc can be struck, it is not necessary to provide a separate filament transformer, and filament windings are wound on the same transformer as the plate winding.

These rectifiers are designed for 20-minute intermittent service cycles, and it filaments thereon are left lighted during the entire length of the show,

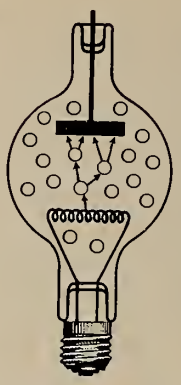


FIGURE 2
In addition to the electrons emitted by the heated filament, a rectifier bulb contains atoms of argon gas. These, when bombarded by electrons, give out additional electrons which increase the flow of current. The diagram shows how a single electron emitted from the filament results in several electrons received by the plate.

the rectifier will become overheated because it will be exceeding the design specifications even though the arc is being burned intermittently.

Current Surge Harmful

Furthermore, if the filaments are left lighted in this type rectifier, and since there is no provision to separate the plate supply from the filament supply, it means that the D. C. terminals of the rectifier are energized constantly. Therefore, to both strike the arc and extinguish the arc it is necessary to connect the lamphouse table switch in the D. C. supply leads. When a switch is located in these D. C. leads and operated to extinguish the arc, it puts a surge on the D. C. Tungar tubes and is apt to cause flashover and destruction of the tubes.

It is our impression that the turning of the filament off and on does not effect the bulb life by causing sagging of the filament, and we believe that we are on safe ground when we state that the life of the bulb is in reality measured by the length of time that it is actually rectifying. Of course, this does not mean to say that the filament might not burn out if the filament were turned on and left on several years without the bulb actually rectifying. However, in average use we would not believe it would make any particular difference in the life of the bulb whether the filaments were turned off or left on continuously. I would suggest you contact some tube manufacturer in regard to this last point.



'MATCHING' APERTURES AND LENSES

(Continued from page 11)

phic section of the table for a relative picture height as close in value as possible to the CinemaScope relative picture height previously found. This will tell you which aperture and lens you must have to match wide-screen picture height to your CinemaScope picture height.

Quite likely you will find two, three, or even four non-anamorphic heights which match very closely your CinemaScope height. That being the case, you have a choice of apertures and lenses! Choose the combination which will give the most pleasing wide-screen picture in your theatre.

A specific example may help to clarify the procedure. Suppose you are showing optical-track CinemaScope (0.839″ X 0.715″ aperture) with a 4½-inch lens behind the anamorphic image-expanding attachment. Which aperture and lens should be used for non-anamorphic wide-screen projection?

The table shows that 0.1589 is the CinemaScope *relative* picture height. Searching through the non-anamorphic section of the table, we find that we may use any of the following apertures and lenses to give a wide-screen picture height which is practically the same as the CinemaScope picture height:

0.825″ X 0.412″ ratio 2/1 lens E.F. 2.50″
0.825″ X 0.446″ ratio 1.85/1 lens E.F. 2.75″
0.825″ X 0.471″ ratio 1.75/1 lens E.F. 3.00″
0.825″ X 0.497″ ratio 1.66/1 lens E.F. 3.25″

In addition to these four wide-screen aspect ratios we may also use the standard aperture (0.825″ X 0.600″) with a 4-inch lens. Now which of these five ratios will you select. We suggest the 1.75/1 aspect ratio as best for non-anamorphic wide-screen. If the management be willing, standard picture format should also be used from time to time. In any case, movable velour-covered side battens are recommended for concealing blank areas of the screen when films other than CinemaScope are being shown.

2. TO MATCH CINEMASCOPE HEIGHT WITH WIDE-SCREEN HEIGHT.

In this type of picture-matching problem, locate wide-screen relative height in the table, and then find one or more CinemaScope heights in the anamorphic section of the table to match. (A difference in height amounting to only an inch or two is not important and is easily concealed by the screen masking.)

3. TO MATCH WIDE-SCREEN WIDTH WITH CINEMASCOPE WIDTH.

Use the same procedure employed for matching heights, but keep in mind the recommendation that non-anamorphic wide-screen aspect ratio not exceed 2/1. You will therefore have to use the 2/1 CinemaScope aspect ratio (aperture 0.715″ X 0.715″).

4. TO MATCH BOTH HEIGHT AND WIDTH OF CINEMASCOPE AND WIDE-SCREEN.

Because widths as well as heights must be matched, use the 2/1 CinemaScope aspect ratio. Instead of searching through the body of the table, merely find the 2/1 non-anamorphic ratio (aperture dimensions 0.825″ X 0.412″) in the left-hand column. The choice is thus considerably restricted, it being necessary only to find the width and height numbers which match very closely the 2/1 ratio CinemaScope width and height numbers.

EXAMPLE: I am using a 5¼-inch lens with the 0.715″ X 0.715″ Cinema-

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Scope aperture. To match this shape and size of picture in non-anamorphic wide-screen, I must use the 0.825″ X 0.412″ aperture with a 3-inch lens. The match is practically perfect, as both pictures have a 2/1 aspect ratio and the same width and height to within a small fraction of an inch at even the longest projection distances encountered in theatres.

5. TO MATCH THE HEIGHT OF "CONVENTIONAL" AND NON-ANAMORPHIC WIDE-SCREEN PICTURES.

"Conventional" pictures are those shown with the standard 0.825″ X 0.600″ aperture. Suppose that we elect to keep on using this aperture (aspect ratio 1.375/1) on most pictures for increased brilliance and clarity, employing non-anamorphic wide-screen only for non-CinemaScope pictures of a "spectacular" nature. And suppose, also, that we wish our wide-screen to have the 1.85/1 aspect ratio.

If the lens used for standard projection is 4 inches in equivalent focus (E.F.), what lens must be used with 1.85/1 ratio aperture (0.825″ X 0.446″) to give a picture having the same height as the conventional picture?

The table shows our relative picture height in standard projection to be 0.1500. The height nearest this value in the 1.85/1 line is 0.1487. This is produced with a 3-inch lens. So, then, we shall use a 4-inch lens with the normal 0.825″ X 0.600″ aperture, and a 3-inch lens with the wide-screen 0.825″ X 0.446″ aperture.

6. TO MATCH THE WIDTHS OF CONVENTIONAL AND WIDE-SCREEN PICTURES.

Stop right here and think! Is any table needed to solve this type of problem? No, it is only necessary to use the same lens with the different non-anamorphic apertures. We do not recommend doing this, for it amounts to nothing more than cropping height from the standard picture without magnifying the resulting wide-screen picture. The effect is terrible!

7. TO MATCH THE HEIGHTS OF CINEMASCOPE, ANAMORPHIC VISTAVISION AND SEVERAL RATIOS OF WIDE-SCREEN PICTURES.

By using the accompanying table, you can easily match the heights of as many different anamorphic and non-anamorphic aspect ratios as you please! Simply decide on one type of aperture and E.F. of lens you intend to use, finding the resulting relative picture height in the table, and then comb through the body of the table to find similar picture heights in the various aspect ratios you desire.

This picture-matching table is designed to aid projectionists and service engineers by instantly revealing all picture-matching possibilities and eliminating tedious arithmetic.

The battle of the aspect ratios shows no signs of abating; in fact, it is getting worse. If two different kinds of anamorphic processes were not enough, Paramount has complicated matters with its double-frame system of projection. Double-frame projection of a horizontally running film, however, does not interest the average theatre owner. The equipment is expensive and troublesome, and does not fit into the average projection room.

Presentation Flexibility Desirable

CinemaScope is the anamorphic system *par excellence*; and even though the Vista Vision method of photographing and printing standard release prints is an important development in the direction of image-definition, anamorphic VistaVision seems unlikely to supplant CinemaScope or even to co-exist with it.

Only those exhibitors who possess adjustable prism-type anamorphic attachments can show anamorphic VistaVision prints without incurring extra expense. The expansion-factor of any lens-type anamorphic attachment is fixed; but many technologists are convinced that lens-type anamorphots are superior to all other types for image-clarity and high light transmission.

The CinemaScope process has been remarkably improved since its introduction. CinemaScope improvements are to anamorphic projection what VistaVision photography and new Technicolor improvements are to non-anamorphic projection. As CinemaScope exists today, it is certainly the equal of any other single-strip method of presenting panoramic movies, not excepting from consideration the various wide-film processes. On the other hand, it is most unlikely that CinemaScope will ever entirely replace standard non-anamorphic films.

The two processes, standard and CinemaScope, may well continue to co-exist in amicable relationship. The motion picture theatre needs them both—standard films for the more intimate and emotional type of drama, and CinemaScope film for the visually grander, but less penetrating, productions.

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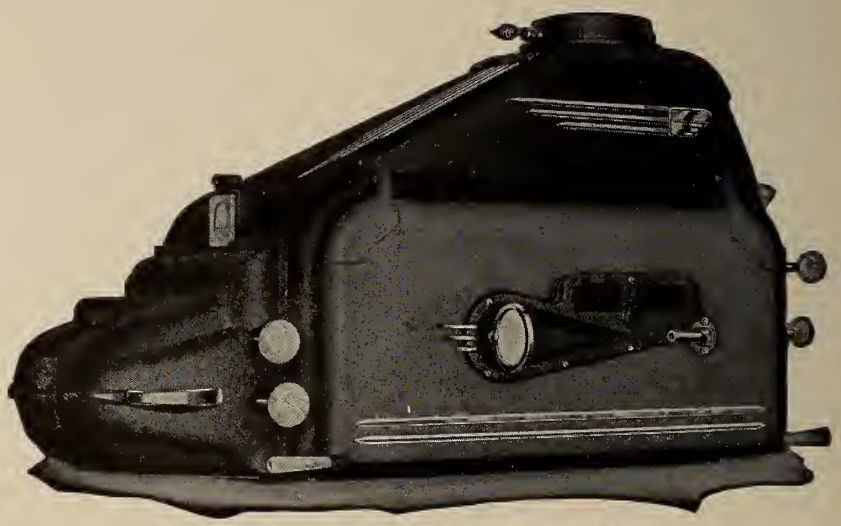
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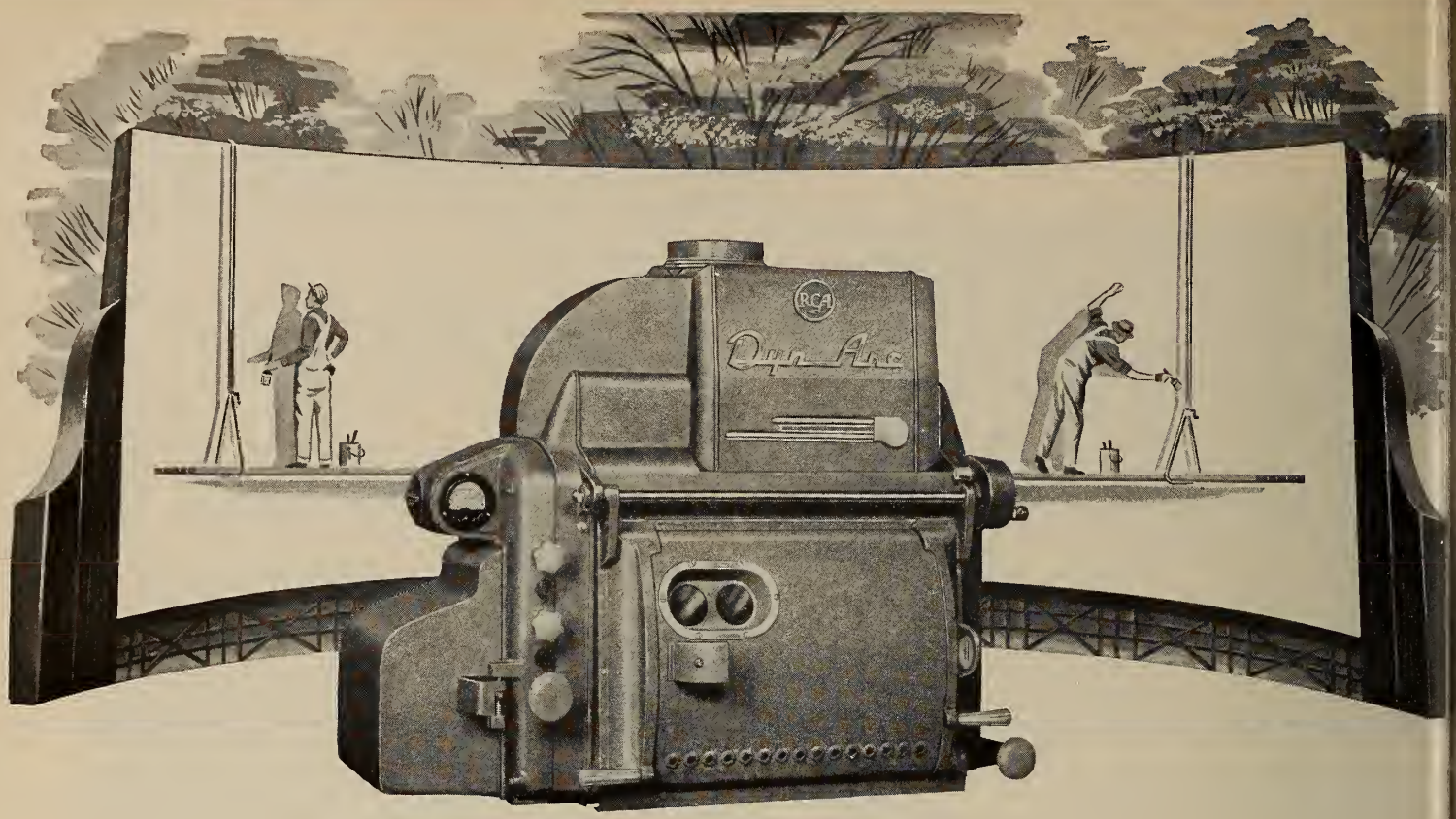
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9E

Monthly Chat

THE theatre projection room, point of final delivery to the customer of the sum total of industry effort, today is but a dumping ground for a huge pile of junk in the form of equipment deemed necessary for the projection of product which in the main reflects only the personal preference of some psycho-producer in Hollywood, or similarly demented distribution executive, who thinks that mere bigness will compensate for their own mental deficiencies.

Typical IP stuff of always being "against" somebody or something, more than a few people will say of the preceding paragraph. And they'll be right, except that they will ignore the fact that much of this "agin" stuff has served to correct more than one deficiency in equipment and in procedure.

For more than a year now IP has sought strenuously but in vain to effect some means for the quick and positive identification of the myriad types of prints which rain down on the average projection room, which is the several-changes-a-week type of operation. The extended-run, main-stem fellows have no worries on this score because for the big dough represented thereby the distributors always extend preferential treatment in the matter of prints.

Everybody and his brother, and particularly those august technical societies with imposing names, agree that it's a wonderful idea and "something should be done." But nothing is ever done about it, despite the fact that IP's file on the topic bulges with pronouncements that an "announcement" will be forthcoming shortly.

"Announcement" about what and by whom? What is so extremely difficult about arranging a meeting in Hollywood of six or seven studio representatives and arriving at an agreement on a standard form of print identification. These guys can spend months arranging for a nation-wide broadcast of a soiree at which Oscars are awarded, but the very medium which carries the impress and conveys to the theatre screen these meritorious performances is not only neglected—it is ignored.

Some day these guys will wake up to the fact that it is the theatre dollar bill which permits their, on the whole, silly indulgences. We don't say that print identification is the most pressing problem facing the industry at the moment, but it is damned important to projectionists who are responsible for delivery in the best possible manner of the product which pumps the lubricant into and through the whole machinery. We're talking about the *money* that Hollywood merely dreams about.

TOLL-Tv requires a channel all its own, meaning a "pay" program and no other. Paramount Pictures (Telemeter) says it has "developed" a means for transmitting two signals on one channel. NOTE: It's not possible to have two signals *of the same quality* on one channel within, say, a radius of 150 miles equidistant. Two *weak* signals, yes, or one *strong* and one *weak* (common knowledge for 25 years), with neither combination applicable to *quality* transmission.


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INTERNATIONAL PROJECTIONIST

VOLUME XXX JUNE 1955 NUMBER 6

Prevention of Damage to Prints

By ROBERT A. MITCHELL

I. Inspection and Repair of Release Prints

NO MATTER how good the projection equipment may be, the results on the screen cannot be satisfactory if the film be defective or damaged. Print quality is not always as good as it should be, and complaints of "poor focus" are on the increase. Projectionists know that the picture on the screen cannot be clearer than the picture on the film. Scratches, torn perforations, and other forms of film damage also militate against good projection.

Film may be damaged in many ways. Some of the causes of print damage are beyond the projectionist's control; but we must face the fact that many injuries, some of them irreparable, are inflicted by improper handling in the projection room. And the term "improper handling" may be extended to include the use of worn and maladjusted projection equipment, thus mutilation of prints is not always the projectionist's fault.

Shipping Damage

It is usually easy to distinguish the effects of normal wear from the inevitable results of injudicious and careless treatment of film. Lack of adequate inspection of prints in the film exchanges, defective splices made by inexperienced examiners, and the continued use of bent reels and damaged shipping cases all contribute to film mutilation.

The projectionist has learned from experience to look for broken and torn edges on prints that arrive at the theatre in shipping cases so badly crushed that they have to be opened with the aid of a hammer, and the reels extracted with pliers. Boxes of film are sometimes handled rather roughly in railway stations, so it isn't surprising that the reels and cases get battered up after years of use. What really embitters the projectionist, however, is the refusal of many film exchanges to repair or replace "dished" shipping cases and "sprung" reels.

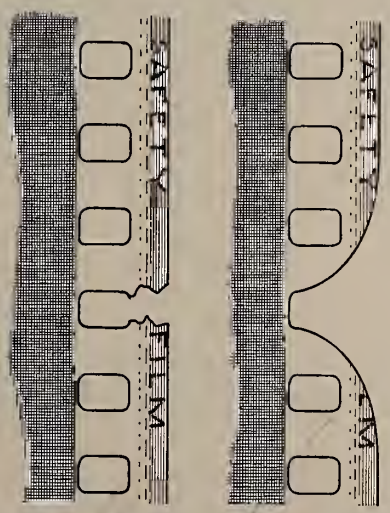


FIG. 1. Torn sprocket holes may be "notched" with the scissors to provide smooth passage of the film. Many authorities, however, disapprove of this practice. More than two consecutive torn perforations require that the film be cut and spliced.

Thus the projectionist's day often begins on a sour note, and his mood is bound to darken when inspection of the film reveals defects which should have been repaired by the exchange. He is forced to make the best of a bad situation, and only in the worst cases refuse absolutely to run the film. Exchanges are supposed to supply prints in runable condition; but the projectionist who projects film from the shipping reels without prior inspection usually finds himself in serious trouble.

Inspection Procedure

Film is inspected by allowing it to run between thumb and forefinger while rewinding it for the first time. The film is cupped only very gently during inspection, inasmuch as severe cupping may split the perforation margins or even crack the film down the middle if the print be dry and brittle. The whole idea is to hold the film lightly in such a way that splices and torn places can be detected when they pass through the fingers. Whatever procedure is followed, great care must be taken to avoid scratching the film.

Exchange "inspectresses" wear cotton gloves while inspecting prints, which may be one of the reasons so many defective splices apparently escape their attention. Most projectionists use their bare hands to locate defects which might cause film breaks and stripped gears in the projectors.

There are many defects to look for. Torn perforations and small nicks in the edges of the film demand attention. Rough and nicked edges may be corrected by trimming the edge of the

film with scissors, and tears extending from a sprocket hole to the edge of the film are sometimes remedied by "notching." Perforation breaks involving only one or two sprocket holes may be "notched," or smoothly cut out with scissors. When three or more perforations are damaged, it is best to cut the film and make a splice.

The secret of notching film successfully is to make a smooth, rounded cut-out. Poorly made notches may catch and tear on the upper guide roller, on the sprockets, or on the flanges of a reel. Certain competent authorities, in fact, condemn the practice of notching torn sprocket holes. The writer speaks only as a projectionist who occasionally notches film and has never had a film break from that cause.

Most projectors which have 32-tooth feed and holdback sprockets are capable of giving good results with film from which the perforation margin has been completely removed from one side of the film. The vast majority of projectors and soundheads used in American theatres make use of 16-tooth upper and lower sprockets, unfortunately. These small sprockets strain the perforations to a serious degree, especially when the reels fail to turn freely, and when small-hubbed reels are used.

This danger is minimized, so far as the upper feed sprocket is concerned, by the 24-tooth feed sprockets of the Simplex X-L projector.

As an alternative to either notching or splicing the film when torn perforations are found, a few projectionists go to the trouble of cementing a patch over the torn sprocket holes. The patch consists of a section of perforation margin cut from new stock from which the emulsion has been washed off. This expedient saves cutting the print, and is highly recommended for prized films from which the loss of even one or two frames would be undesirable.

Weak Splices a Tough Problem

Splices found in theatre-release prints are a frequent source of annoyance to the projectionist. Exchange-made splices are very good, as a rule, but they are sometimes too weak to be safely projected. Many of the defective splices are embossed with the exchange's initials or with the letters "OK."

The problem of weak splices may be traced to a fear of using an adequate quantity of film cement. Film experts have often cautioned against applying *too much* film cement, and this advice has frightened inexperienced exchange inspectresses into using *too little*. Too much cement may weaken the film at the edges of the splice, but too little results in a splice which comes apart at the slightest strain.

The strength of a splice in the perforation-margin area is the most important factor of all, yet many exchange-made splices have a tendency to "lift" at their ends. Too little cement applied to this region is one cause of the trouble; inadequate scraping of the film stub is another. It is sometimes possible for the projectionist to strengthen these splices sufficiently by dabbing film cement into them and pressing them with the fingers. But no amount of film cement will make a strong splice if the stub has not been scraped enough to remove the gelatine emulsion-coating!

It is admittedly possible to make strong splices by hand, but hand-made splices never pass through the projector as smoothly as a good "machine-made" splice. In a certain sense, however, all projection-room splices are "hand-made." The ordinary type of splicing block merely assists in the registration of the sprocket holes and insures the application of uniform pressure to the join while the film cement "sets."

Splicing Safety Film

The first and most important step in making a satisfactory film splice is the scraping of the stub. Not only must *all* emulsion be removed from the area of contact, but also the thin binder layer of clear gelatine. It is best to roughen slightly *both* contact areas — the scraped stub and the base side of the butt stub.

Most projectionists employ "wet scraping." The gelatine emulsion-coating is first moistened to facilitate removal, and the actual removing accomplished by scraping the stub with a razor blade. The trouble with this method is that it is difficult to get all the emulsion off in the perforation margins without tearing the film. Dry scraping with a medium grade of sandpaper gives better results if care is exercised not to scrape the stub too thin. It takes practice to know just when to stop scraping.

The dry-scraping method works best when the sandpaper is backed by a small wooden block to hold it flat and insure even scraping. Small scraping blocks with the sandpaper glued to them are readily available.

There is no discernible basis for the criticism that the use of sandpaper for dry-scraping film stubs leaves gritty particles which will injure projectors. Splices made by this method are wiped with a clean cloth like other splices, at once removing any dirt which may accidentally adhere to the film.

Every projectionist should make "1-hole" splices, with the stubs cut straight across. The ends of the stubs should never be mitered, for the greater the contact-area in the perforation margins, the better the splice will hold. "Hairline," or negative-type, splices should not be made in release prints unless a "hot-weld" splicing machine is used. Curved splices are tabu.

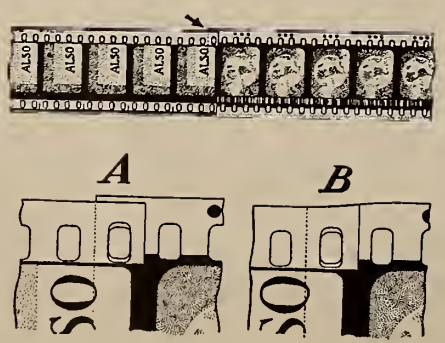
Cleanliness a 'Must'

To repeat, single-coated optical-track film requires scraping of the emulsion-coated stub cut one sprocket hole beyond the frameline. The base side of the butt stub (cut on the frameline) should be wiped free from oil or, preferably, slightly roughened to insure good solvent action of the film cement. The applicator brush should be large enough to enable a liberal quantity of cement to be applied to the stub in just one stroke.

No time should be lost between application of the cement and joining the stubs under firm, even pressure. The splice is permitted at least 10 seconds, and not more than 15 seconds, for the cement to set. Then the pres-

(Continued on page 37)

FIG. 2. When unshrunken film is spliced to shrunken film, the resultant rough edge should be trimmed smooth.



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What is (K°) Color Temperature?

FROM time to time IP readers encounter the terms "3400 K" or "5500 K" and probably wonder what is the significance of the expression "K". This terminology has induced many inquiries as to its application to motion picture work.

The term "K" stands for Kelvin, which is the standard scale of measurement of the color *quality* of light. In other words, "Kelvin degrees" would denote the "color temperature" of a light source.

The color content of a light beam is measured by a color temperature scale. Tungsten filament light, such as is used in a heavy proportion of studio floodlights and in 16-mm projector lamps, have a color temperature of about 3400 K. The light of a high-intensity arclamp is rated at about 5500 K. and is much more "white" to the eye than the yellowish tungsten light source. The light of the mid-day sun is rated at about 6100 K. Although mid-day sunlight actually has a slight bluish cast, it is the "whitest" of all known light sources. The high-intensity carbon arc is one of the few artificial light sources that come close to it.

Simple Definition: "Quality"

What, then, is "color temperature?"

Use of the word "temperature" in referring to this measurement for the *color quality* of light is apt to be confusing because one is not ordinarily disposed to associate "temperature" with "color". Actually, this relationship is easily understood.

If you were to take a poker and heat it over a flame until it began to glow and give off light, you would find that the light was a dark red. Heating the poker to a much higher temperature would cause it to give off a white rather than a red glow when the poker became "white hot."

Taking, Showing Light Balance

In short, then, "color temperature" refers to the color of the light governed by the intensity to which the light-emitting medium is heated.

Color-temperature standards have become increasingly important in calculations of studio technicians because of the mounting present-day emphasis on the use of color in pictures.

This color-temperature measurement gives an accurate indication of the special color quality of light—*provided*, of course, that comparative projection conditions be equal—arc-lamp, optical train, speed of lens, *etc.* If, for instance, the beam contains a predominance of light from the lower, or reddish, end of the spectrum, or from the higher-frequency blue waves at the other end, reasonably accurate readings are necessary. Special color-temperature meters are now available for such measurements.

It becomes immediately apparent that a proper balance, in terms of color temperature, be maintained between the taking (studio) and the projection light sources.

Color prints, whether they be Technicolor, Eastman Color, Ansco Color, or some other variety, should be "balanced" for projection with a high-intensity arc. The projectionist will have no problems in this regard if the

Aperture for RKO Superscope 2/1 Prints

NOW THAT the final decision (we hope) has been reached to adopt the 2/1 compression ratio in the *production* of all RKO "squeezed" prints for the so-called Superscope pictures, it is apparent that all anamorphic optics, both cylindrical and prismatic types with a fixed expansion ratio of 2/1, already in use for CinemaScope projection may also be used with the RKO Superscope releases.

Reduce Image Frame Width

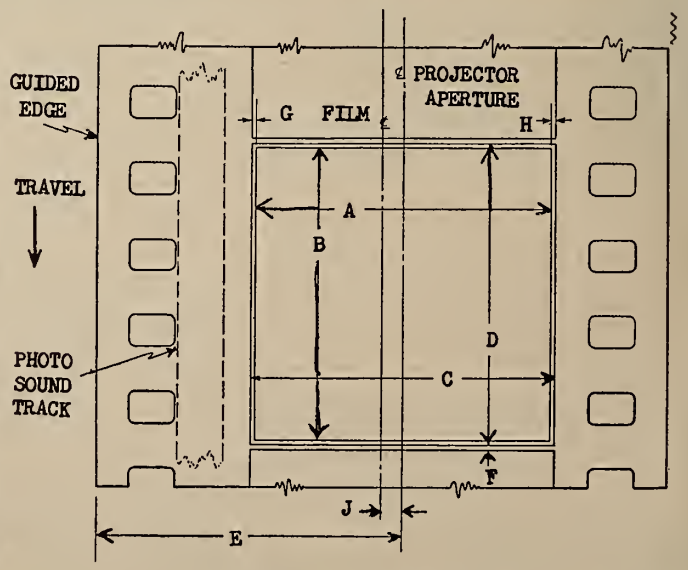
At first flush it would seem that RKO has gone over completely to the 20th-Fox camp—but RKO will retain a *projected* picture ratio of 2/1, as contrasted with the 20th-Fox 2.55/1 screen image. RKO was strongly tempted at first to adopt the 1½ compression ratio, but was deterred by the numerous CinemaScope installations world-wide. But in projection RKO stood fast for the 2/1 screen image.

One may ask how is this accomplished with a 2/1 "squeezed" image. The answer is simply that the *width* of the picture frame needs be cut—to an extent, in fact, where it is practically square. All that will be necessary in those theatres now equipped for CinemaScope (whether using fixed cylindrical or the variable anamorphic lenses) is a pair of new apertures plates cut to the appropriate dimensions and, of course, proper adjustment of the screen masking for the 2/1 screen image.

Included herein is a drawing supplied by the Research Council of the Academy of M. P. Arts & Sciences which gives the proper dimensions for the cutting of the aperture plate for RKO Superscope release prints with *optical, not* magnetic, soundtrack and standard film perforations.

DIMENSIONS OF RKO 'SUPERSCOPE' PROJECTOR APERTURES

All figures in inches. A — 0.175 maximum; B — 0.175 maximum; C — 0.735 minimum; D — 0.735; E — 0.738 plus or minus 0.002; F — 0.013; G — 0.010; H — 0.010; J—0.049. The center lines of this and the standard 0.600 x 0.825 aperture are identical — that is, 0.738 from the guided edge.



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lamp arc-gap and reflector or condenser are adjusted properly.

The color temperature of the edge and center of the arc gas-ball and tail flame in an arclamp have somewht different color temperatures. This can be observed if the reflector mirror of the lamp be moved so that it focuses the *edge*, rather than the *center*, of the gas-ball on the aperture. The light will then take on a slightly yellowish tinge—no good for projection. This procedure changes the color-temperature of the arc setup—precisely what we are talking about.

Low-intensity lamps, now rare in theatres, are not suitable for presenting modern color motion pictures because the *yellowish* quality of their light distorts the inherent color-quality of the print as "shot" and processed.

The Term "Black Body"

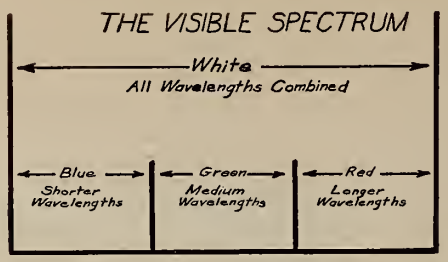
Another term, "black body," is associated with the Kelvin scale of measurement because of the difficulty in practice of obtaining a *true* temperature reading for the color quality of light, similar to that used for measuring the temperature of the aforementioned stove poker. The quality of light emitted by a red-hot or white-hot poker might differ slightly in character from the light emitted by some other object heated to the same degree. This difference would result from the ability of these objects to reflect extraneous light falling upon them, in addition to the light generated by the heat directly applied.

Therefore, the Kelvin scale provides a measurement for the color quality of a light source by matching this light to the light emitted by a perfectly black body when heated to a comparable degree. The black body cannot reflect light, thus its temperature may be used as an accurate gauge of the color of the light. The Kelvin scale measures temperature in degrees Centigrade from absolute zero, which is —273 degrees C.

Before the days of color photography, the motion picture industry was not much concerned with color temperature of a light-emitting source. Intensity of light, or the total number of lumens delivered from a light source, plus the exposure time required by the film, then in use, were the main interests of the cameramen.

Amber-Tinted Release Prints

In projection, the color temperature of the outmoded low-intensity arc



Diagrammatic representation of the color spectrum as sectionialized in wavelengths.

gave a yellowish glow to the screen with black-and-white films, but this did not concern unduly an industry that was then in the habit of adding an amber tint to the clear film base for a much stronger coloring of the screen image. Amber light, it was felt, made for a more pleasing picture.

Color pictures altered radically this situation. Basically, the cameraman faced the same problems as an amateur who wished to take "still" color snapshots. The amateur finds in the photo supply store two types of color film: one for use outdoors with sunlight, the other for use indoors with flashbulbs or photoflood lamps.

The reason why two types of color film are needed even by the amateur is the great difference between the color temperature of sunlight, (6100 Kelvin at mid-day) compared with approximately 3400 for the tungsten flash or photoflood bulb. Indoor film needs a strong blue-response in order to balance the excess of red in the artificial light source; while the outdoor film needs a relatively stronger response to red. It follows, then, that film balanced for use outdoors cannot give good results with artificial illumination unless some sort of specially colored flashbulb or filter is used to reduce the reddish quality of the light.

Studio Lighting Problems

The problem of matching color film to the light source for which it is balanced, when considered in relation to motion picture production, thus complicates an apparently simple problem. Consider, for example, an indoor color set:

A volume of light much greater than that required for black-and-white photography must be obtained and concentrated in a limited space. Both carbon arclamps and tungsten floodlights are frequently required to supply the desired level of illumination on various parts of the set. Tungsten lights, although effective, cannot supply the brilliant concentration of penetrating light needed for sharpness of detail—contrast values. But, because of the difference in color temperature, arcs and tungsten should not be mixed indiscriminately.

One solution is to lower the color temperature of the arcs by utilizing a pastel color filter. Then the light is right for color film *balanced* for tungsten. This procedure has the disadvantage, however, of lowering considerably the total *amount* of light emitted, in addition to altering radically the color temperature. Another solution is now being found in special low-color-temperature carbons designed so that studio arcs can be mixed with tungsten without filters (a recent National Carbon Co. development).

Expense-vs.-Cost Factor

An important aspect of the color-balancing problem with reference to arcs *vs.* tungsten is the expense-vs.-result factor. In a probably unjustified move a few years ago, producers switched from the use of arcs to tungsten because of the latter's vaunted economy of operation. Arcs were reserved for special situations, the cameraman being greatly limited thereby in the effects he could obtain. Probably, the new carbons mentioned previously will provide a technically effective and economical solution for color lighting problems.

When color film is used, the cameraman must be constantly on guard not only that the *volume* of light is great enough for the aperture of his lens, but he must be constantly assured that the *color quality* matches the sensitivity of the film being used.

The projectionist need only be sure that his high-intensity arclamp is functioning properly. If it is, the light produced is of exactly the color temperature to produce the best possible color rendition of the release print.

[Ed.'s Note: IP will present in an early issue, probably the next, the results of the painstaking research and exhaustive tests under actual studio conditions which crowned with success the search for a "hard-arc" (carbon) light source to complement the spectral characteristics of the "soft" (tungsten) studio light sources and thus make possible a better quality release print.]

Paramount Theatres 'Scope Cost

A total of $6,369,000 was spent by American Broadcasting-Paramount Theatres during the years 1953 and 1954 for complete CinemaScope and stereophonic sound installations in 260 of its theatres. Most of the circuit's 639 theatres now have wide screens.

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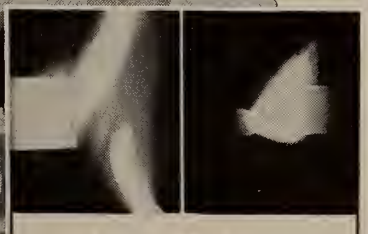
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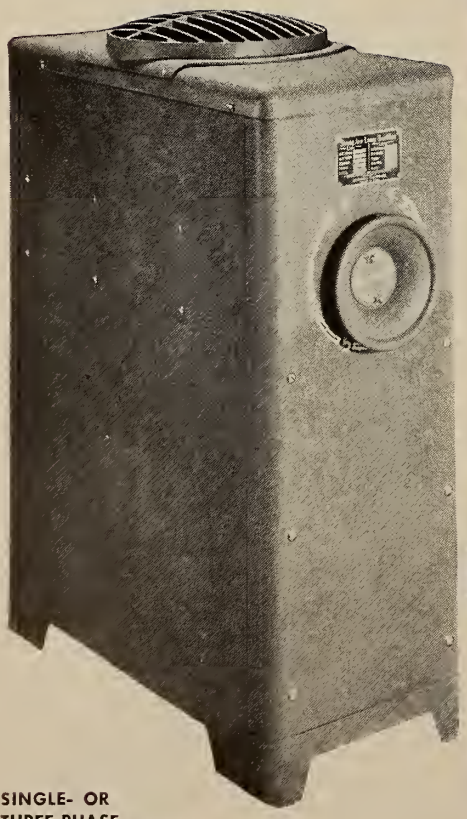
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A Research Triumph: The Story of Black-and-White Film†

By C. E. KENNETH MEES

The steady improvement in the motion picture screen image over the past 50 years has to a large extent, been made possible by the successful efforts of the Eastman Kodak Co. and other companies to develop better negative and positive print films. The story of these efforts is appended.

THE PRODUCTION of motion pictures involves a combination of the theatrical art and photographic technique, and its history has depended upon the development both of the theater and of photography. I have been asked to give you an account of the development of the films used in making motion pictures, and in doing so I must call attention to the close relation between the methods used in the production of pictures and the nature of the films which have been available.

This account deals only with the films manufactured by the Eastman Kodak Co., a record of which was available to me. A number of other manufacturers have played an active part in the development of the industry and have made a variety of films. The Lumiere Co., of Lyons, France, made film at a very early date in connection with the development of motion pictures by Auguste and Louis Lumiere and later sold a considerable quantity of motion-picture film to American users.

Early Film Manufacturers

In 1918 the DuPont Co. commenced the manufacture of motion picture positive film and have since made a range of films for motion picture purposes. The Agfa-Ansco Co. manufactured motion picture positive film, and their successors, the Ansco Division of the General Aniline and Film Co., have been active in the supply of film to the industry.

This account of the development of motion picture films deals only with the films which produce monochrome, or black-and-white, images.

The beginning of motion picture production in the United States was associated with the first production of transparent film, made for use in Kodak cameras. In 1887, W. Dickson was working in Edison's laboratory in West Orange, N. J., on an instrument to be used with the Edison phonograph to reproduce motion as well as sound. In this instrument very small images were photographed in a continuous spiral on a cylinder, as sound is recorded on the phonograph cylinder.

In September 1889, Dickson sent an order and $2.50 to George Eastman for a roll of film 35-mm in width. This film was used in a new type of kinetoscope for taking motion pictures on a continuous strip of film which was standardized at a width of 1⅜ inches, with four perforations to a frame along both edges, the film which in essence is that used today.

Dual-Purpose Emulsion

The emulsion was that used in the Kodak cameras, and at first this film was used for making both negatives and prints, but in a very short time a special film was made for positive prints. It gave more contrasty and brighter prints and, being of lower speed than the camera film, it was easier to handle in printing.

In 1916 only two motion picture films were available—a negative film for use in the camera and a positive film for making prints. The negative film was sensitive to blue, violet and ultraviolet light, and it was necessary to expose it outdoors by daylight or in studios by the use of arclamps. Thus, motion picture studios found California, with its abundant sunshine, a convenient location, and a number of excellent lighting units using arclamps were developed, at first to supplement and later to replace sunlight.

In January 1917, a change was made in the basic emulsion of the negative film which was known simply as "motion-picture negative film" until, owing to the introduction of other films in August 1925, its name became Motion-Picture Negative Film Par Speed.

Print Identification Markings

As new films were introduced, it became necessary to use some identification for the type of film other than rather indefinite names, and the Eastman Kodak Co. adopted the practice of assigning type numbers to the films, using new numbers not only for new kinds of films but for new varieties of the same kind, the old type being continued on the market for the convenience of customers until it was effectively replaced by the new.

The type numbers constituted to some extent a code. Thus, 1 indicated a film on nitrate base; 2 in the second place indicated a negative film. Par Speed negative film was therefore assigned Type 1201, and its emulsion continued essentially unchanged until it was discontinued in July 1942.

Panchromatic Negative Film

As early as 1913, experiments were being made by Eastman on the production of a panchromatic negative film. The first panchromatic film was made for use in the Gaumont process, an additive procedure of color cinematography in which negatives were made simultaneously through three lenses equipped with suitable filters, and the pictures were projected in register by a three-lens system. This process was introduced by Leon Gaumont in France, and Mr. Eastman decided to consider its introduction upon the American market.

Gaumont made his panchromatic film by bathing negative film in dye solutions, but this process is very prone to give spots and other defects. Our experience with the Wratten panchromatic plates had shown that there was no great difficulty in sensitizing an emulsion to make it panchromatic. The real difficulties lay in the condi-

(Continued on page 36)

† Condensed from the "History of Professional Black-and-White Motion Picture Film," Journal of the SMPTE, Oct., 1954

Lester Isaac . . .

CINERAMA Caps Notable Career



CINERAMA is known to informed technicians in the audio-visual field as a "class" operation, and to the exceptionally well-informed and serious-thinking in this group it is "magnificence" itself. In conception, installation and utilization of intricate equipment and precise presentation, there has never been a standard of comparison for Cinerama.

The Cinerama process has been the topic of thousands of words in the public, trade and technical press; but the man who assumed and discharged brilliantly the tremendous responsibility for presenting Cinerama in flawless style to audience throughout the world has been mentioned, comparatively, only in passing.

Fitting it is that this man should be the subject of a personal niche in these pages, because he started with, and through more than 40 years has grown increasingly closer to, the projection craft.

This man is Lester B. Isaac, director of exhibition for Cinerama.

Cinerama Top Challenge

So challenging was the problem of introducing Cinerama to world audiences and thereafter maintaining its supremacy in the entertainment field, that Lester Isaac today states with obvious sincerity that he considers his whole life as a schooling for the task.

The trail to his present eminent position in show business started back in the early 1900's when he was a medical student, paying his way by working evenings in the then-popular nickolodeons. Like so many of his fellow craftsmen of today, he quickly succumbed to the lure of show business and became a member of IA Local 224, Washington.

Soon he was selected to manage the White House projection room, a service which he renderd through the administration of presidents Wilson, Harding and Coolidge. Simultaneously he conducted a motion picture supply business and also served as chief projectionist for Loew's theatres in the Washington area.

To Loew's Post in 1926

Then in 1926 he came abruptly to a fork in the trail: with sound pictures looming on the horizon, he was summoned to New York to assume the post of national director of visual and sound projection for Loew's, Inc. His contributions to the rapid growth and continuing refinement of this new form of entertainment were many and, in not a few instances, most significant — so much so that his name is today very well known world-wide.

Despite the exacting and often hectic demands of his Loew's duties, Isaac persisted in his determination to broaden his intellectual base. This resolve resulted in his winning an engineering degree, and in continuing intensive studies in sound and optics and in lighting and decoration.

Recognition of his many-faceted abilities came in the form of offers to "do" major Broadway productions; and probably his finest achievement in stagecraft was the supervision of one of New York's outstanding annual charity affairs, the "Night of Stars," which presented hundreds of the best performers, innumerable changes of lighting and staging, and was given at, of all places, the vast Yankee Stadium before an audience of more than 50,000 people.

'Borrowed' by O.S.S. During War

These manifold talents won almost instant recognition when the United States was plunged into World War II. Isaac was "borrowed" by General William ("Wild Bill") Donovan head of the famed Office of Strategic Services, to head up a special unit which would provide in graphic form data on the many phases of the war around the world to top directive personnel, including the late President Roosevelt.

Many types of film, along with weather charts, production graphs, maps and much other highly classified information were projected by special devices in a protected, soundproof room designed by Isaac.

During this period Isaac became acutely aware of and intensely interested in a really "new" development in his chosen field of endeavor — the multiple-projector system devised by the late Fred Waller to simulate on a vast panorama actual flying scenes so realistic as to provide Air Force personnel with an invaluable means for identifying various types of planes, friend or foe. This was an exhilarating experience for Isaac; but he himself did not know at the time how prophetic it was.

Another invaluable experience for Isaac during the war years was attendance at the very hush-hush and highly-demanding electronics school at Lexington, Mass., staffed by the best technical brains available.

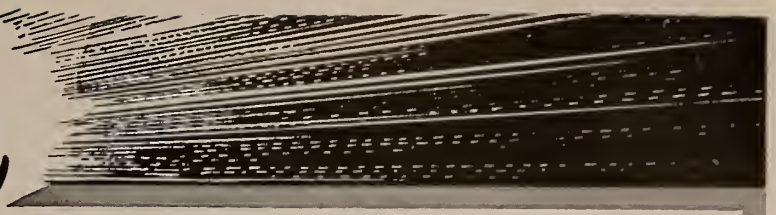
Enter Cinerama—Greatest of All

Following his war service, Isaac returned to his post at Loew's, where he continued until Cinerama shattered the lassitude that had settled upon the motion picture exhibition field. On March 6, 1953, Isaac terminated his Loew's affiliation after 27 years of continuous service, —only to face the greatest challenge to his impressive store of knowledge in the many diverse branches of big-time show business—Cinerama.

How well this challenge was met is now a matter of history, and the contributor of several vital chapters to the chronicle was Lester Isaac. Geographically, Cinerama spans the earth: 14 major cities in the U.S.; two in Canada; London and Paris; two cities in Italy; two cities in Japan—these installations

(Continued on page 35)

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In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

FREQUENT references in this corner to the ravenous appetite of Tv for filmed program fare and the inevitable opportunity for greatly expanded employment opportunities for knowing film technicians were brought sharply into focus at the recent meeting of the National Ass'n of Tv Film Directors.

Motion picture film now accounts for approximately 55-60% of Tv presentation "air time" and is expected to increase materially in the next few years, stated T. Gentry Veal, of Kodak Research Labs. He added that "continued development in Tv apparatus has resulted in a gradual improvement until today it is difficult to distinguish the difference between 'live' studio pick-up and good film reproduction."

While there was much discussion at the meetings of improved Tv apparatus of a semi-automatic nature — such as the vidicon Tv tube, which has already rendered obsolete the iconoscope; the flying-spot kinescope for color Tv, and several models of continuous-type Tv film projectors — it was freely acknowledged that there would always exist a need for trained workers in the Tv art.

Projectionists would do well to keep themselves informed of such development in Tv so as to have at least a rudimentary working knowledge of the various processes.

• The recent 40th anniversary celebration of IA Local 568, Columbus, Ga., brought together for the first time in the Local's history the heads of both Labor and management. Richard F. Walsh, president of the IATSE, and E. D. Martin, head of Martin Theatres, Inc., one of the largest theatre chains in the Southeast, and president of the TOA, were the guests of honor at the celebration.

IA President Walsh addressed the assemblage, praising the fine relationship now existing between the labor-management groups in the industry and stating that "we have always been able to sit down and bargain without arguing." Mr. Martin endorsed Walsh's remarks, adding that he considered the members of the IA as the "core of the industry," and expressed the opinion that the progress of the entertainment field was due in large measure to the wonderful spirit of cooperation between labor and management.

Among the invited guests were Albert S. Johnstone, IA vice-president; Mayor E. C. Berry of Columbus; J. B. Pate, president, Georgia Federation of Labor; Charles K. Murphy, president, Columbus Central Labor Union; R. E. Martin, secretary-treasurer, Martin Theatres; and Emil Bernstecker, district manager, Wilby-Kincey Theatres. Present also were members of many nearby sister Locals.

A. B. Teel, president of Local 568, presided at the banquet.

• Friends of Charlie Muller, director of projection for the world-famous Radio City Music Hall in N. Y. City, will welcome the word that this internationally-known exponent of the "best" in projection presentations is making fine progress in physical repairment. The nerve-shattering effect of the stringent requirements of what is probably the most exacting projection job in the world, laid Charlie on the ropes temporarily (as they positively would after 23 years in such a post) and are being overcome gradually, with the most serious detriment to more rapid progress being a chafing-at-the-bit attitude on the part of this old warhorse to return to action on the showmanship track.



Charles Muller, director af projection at the world-famaus Radia City Music Hall in N. Y. City

Those of us who wish Charlie only the best (and we are legion) can do him no greater favor than to drop him a line at either the Hall or at his home, 99-60 Sixty-Fourth Avenue, Forest Hills, N. Y. and tell him with kindly firmness to "take it easy, Bessie."

• H. M. ("Doc") Elliott, member of Local 173, Toronto, Canada, who visited the IP offices several times during his recent sojourn in New York, asks in a letter to the editor if the electronic viewfinder described in the video-film camera article in IP last month is applicable to "regular" cameras to the extent that it might improve the focus of motion pictures. The answer is "No"; this monitoring appendage to such a dual camera is for snooty directors and cameramen who wish to check instantly the many mistakes they make as they go along—as an economy measure, naturally.

• Pay-as-you-see Tv was the main topic of discussion at the recent New York State Association of Motion Picture Projectionists meeting in Albany, N. Y. James J. Brennan, 1st IA vice-president, advised the delegates to fight toll-Tv as



Assemblage at the recent 40th anniversary af the Columbus, Ga., Local Unian 568 which marked the first farmal social get-tagether af bath management and Labor in that area. The attendance at the affair af IA President Richard F. Walsh signalized this auspiciaus accasian.

a menace to the motion picture theatre, particularly to the small theatres in outlying districts. The Association voted to have all its member Locals send letters of protest against this form of Tv to the Federal Communications Commission in Washington, D. C.

Also discussed at this meeting was the operation of the New York State Compensation Board and what it means to the worker. Judge Nat Doragoff, member of N. Y. City Local 306, and a referee of the New York State Compensation Court, explained the functions of this Court and how the workers in the State are protected in the event of injuries incurred while on the job. Copies of Judge Doragoff's address were sent to all Local members of the Ass'n.

Other speakers included Paul D. Ries, A. B. West, Philip H. Freeman, and C. A. Lovgren, of National Carbon Co.; Arthur Meyer, International Projector Corp.; Wm. B. Spooner and George H. Walter, Lorraine Carbons; H. Paul Shay, secretary-treasurer for the 10th District; Ralph J. Mauro, National Theatre Supply branch manager; Anthony Boscarelli, vice-president, and Edward J. Doughterty, past-president, 25-30 Club, and William H. Ingram, service engineer for the Schine Theatres.

At the close of the meeting, the Association's delegates and guests attended a midnight banquet tendered by Albany Local 324 in celebration of its 41st anniversary. Dancing and entertainment, plus beautiful souvenirs, made the party one long to be remembered by all those present. Eddie Went, Bud Hill, Rocky Memole, and Frank Matthews were in charge of arrangements for the Albany Local.

• The welfare fund set up for the members of St. Louis Local 143 about a year ago was finally okayed by the Internal Revenue Bureau. The exhibitors will contribute 5% of projectionists' wages to this fund, and when $50,000 has been accumulated, members of the Local who have reached the age of 65 and have held membership in the Local for 25 years will be eligible for retirement and receive a monthly pension of $75. Retiring members with 15 years membership in the Local will receive a pension of $50 per month. Retirement is voluntary, and the Local pension will be in addition to social security benefits. Trustees of the fund are Robert Tomsen and Philip Murphy for Local 143, and Louis K. Ansell and James H. Arthur, for the exhibitors.

• A recent press release (Reuters) from Kiel, Germany, tells of the 16-year old boy who stole and so expertly dismantled a motion picture projector from a local movie house that the theatre manager refused to press charges against the thief lest the career of a "brilliant young technician" be ruined. When caught, the boy reassembled the projector without a hitch.

• While chatting with W. J. Courtney, secretary of Local 349, Lima, Ohio, during his visit to the offices of IP early this month, we were advised about the Local's new five-year contract recently concluded with the drive-in and downtown exhibitors. The new contract provides for a weekly increase of $3.00 for the first three years, and an additional $2.00 per week for the next two years; a work week of 36¾ hours, two-weeks vacation with pay, and time-and-a-half for overtime.



Irving Merkur, projectionist-manufacturer and president of Ace Electric Mfg. Co., tendering his contribution to the Harry Sherman Heart Fund through the good offices of Ben Stern, treasurer of the 25-30 Club of N. Y. which sponsors the Fund.

• Increases of from 14c to 21c per hour were granted to the projectionists working in the Odeon Theatres, under a contract concluded between the theatre circuit and Local 299, Winnipeg, Man., Canada.

• Twenty-five years ago: the IATSE held it 30th convention at the Alexandria Hotel in Los Angeles, Calif., the week beginning Monday, June 2, 1930. Do you remember?

Goobledegook on California Arbitration Award

IP Sustains Compound News Fracture

FALLIBILITY being the heritage of humans—editors and printers no less than manufacturers and projectionists—it is not surprising that in IP for April there appeared on the makeup for page 21 ("In the Spotlight") two items beginning with the phrase "The California . . .", one referring to a State Fair and Exposition, the other to an important judicial decision bearing on a contested arbitration award.

Seemingly playing no favorites with the Golden State, the compositor figured that any items relative thereto were concomitant, so to speak. In any event (and IP ducks no responsibility for this displacement of type matter) here is the story in toto of the arbitration award:

The California District Court of Appeals recently upheld an arbitration award denying the claims by Southside Theatres, Inc., of Los Angeles, that IA Local 150 violated its contract by demanding the employment of two projectionists for the showing of 3-D pictures. About a year ago Judge Praeger of the Superior Court handed down a ruling vacating the arbitration award originally granted in favor of the union.

In a unanimous opinion by the presiding justice, the Appellate Court reversed the Superior Court ruling and directed confirmation of the arbitration award. The upper Court upheld Local 150's contention that "the arbitrators acted within their powers in undertaking to make a determination as to the scope of the contract" and that the award in favor of the union "would leave it free to insist upon a new or supplemental agreement settling the 3-D picture dispute."

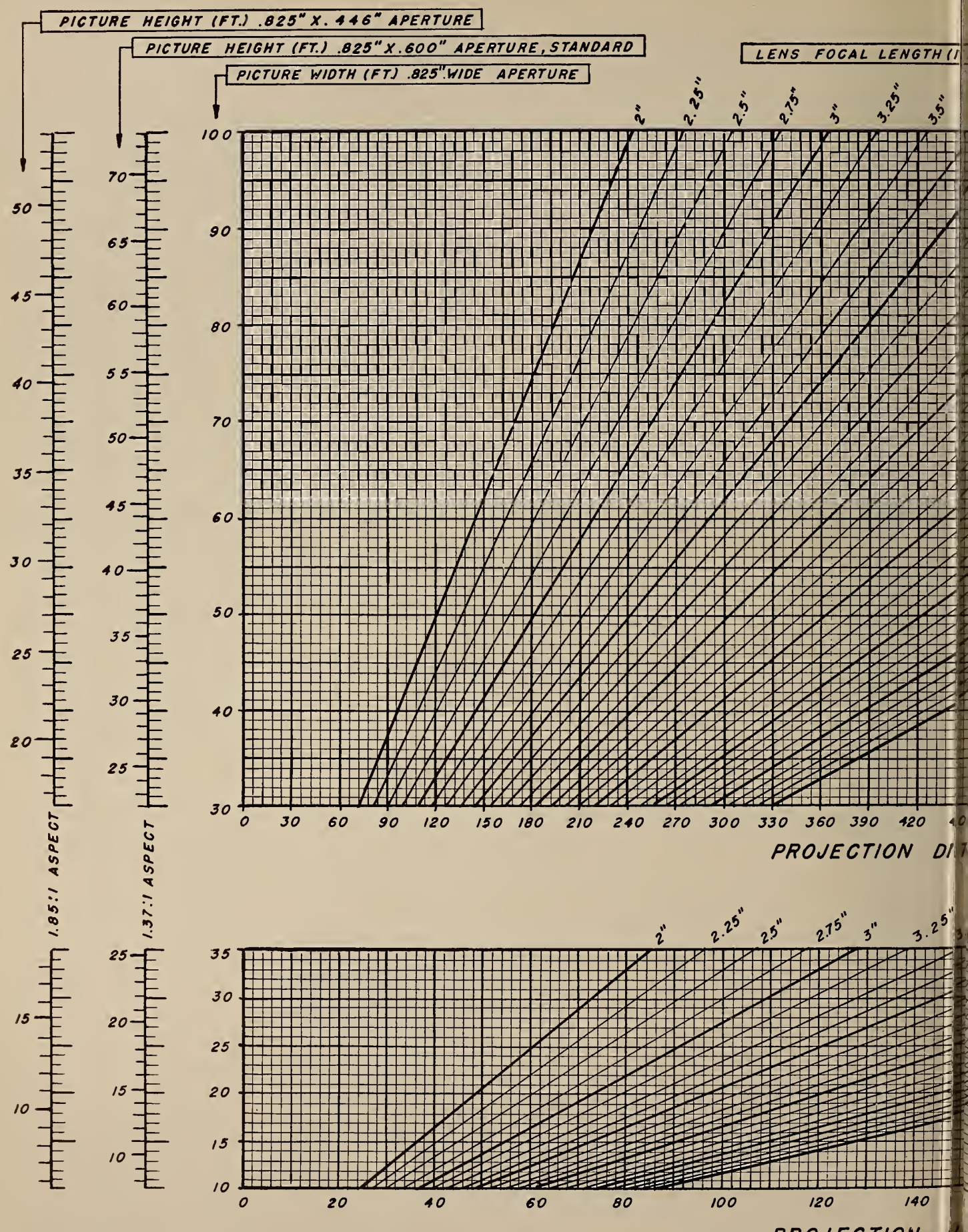
The Appellate Court declared that "the demand of the theatre was denied because it was determined that the *contract did not cover 3-D projection.*" That's that.

Closed-Circuit Tv Contract

Theatre Network Television has entered into a year's contract with the drug firm, Smith, Kline and French to handle all closed-circuit Tv programs that the latter firm sponsors for sales purposes. This is a departure from the usual method of arranging closed-circuit Tv programs and indicates the growing importance of this medium. Until now, such agreements had been on a single-program basis.

The TNT closed-circuit newtork utilizes theatre Tv equipment setup in theatres and hotel ballrooms in 36 cities throughout the country for business sessions. On several occasions the drug firm reached 23,000 doctors in 32 cities over this network.

KOLLMORGEN LENS-SCREEN SELECTOR CHA

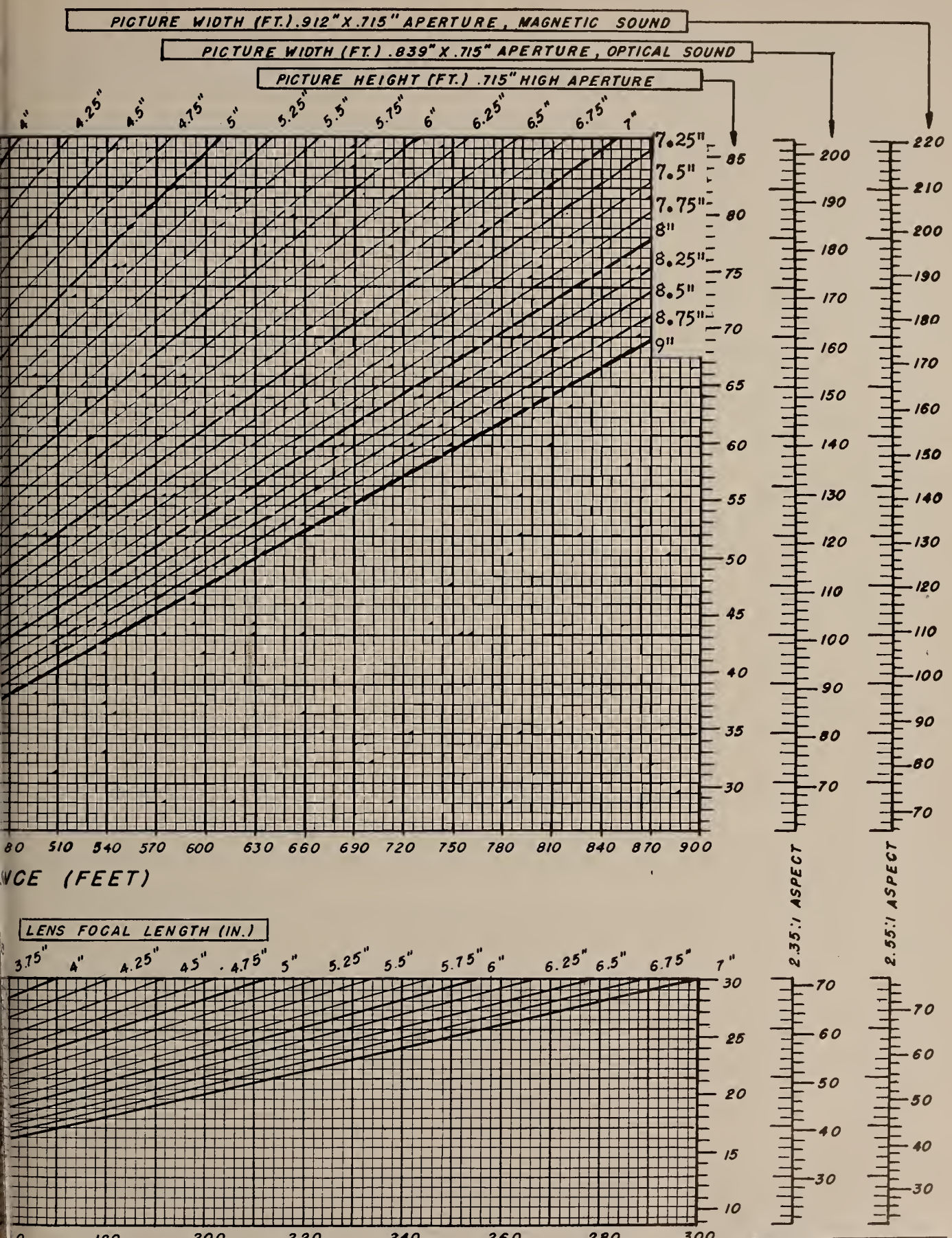


This chart is unique in that it is scaled not only for both magnetic and optical sound reproduction, but also for both the standard and wide-screen apertures—another IP "first"!

Here is a typical example of how best to apply this chart to an actual projection operating condition: with a standard aperture, you have a 4.25-inch (4¼) focal length lens and a projection "throw" of 360 feet. So, to find the correct picture width a only to enter the chart at the 360-feet projection and use the follow-up line to where it meets the diagonal line.

Lay a ruler or straight-edge on the horizont intersection and follow the line to the left-hand

T: Lens Focal Length, Picture Width and Height



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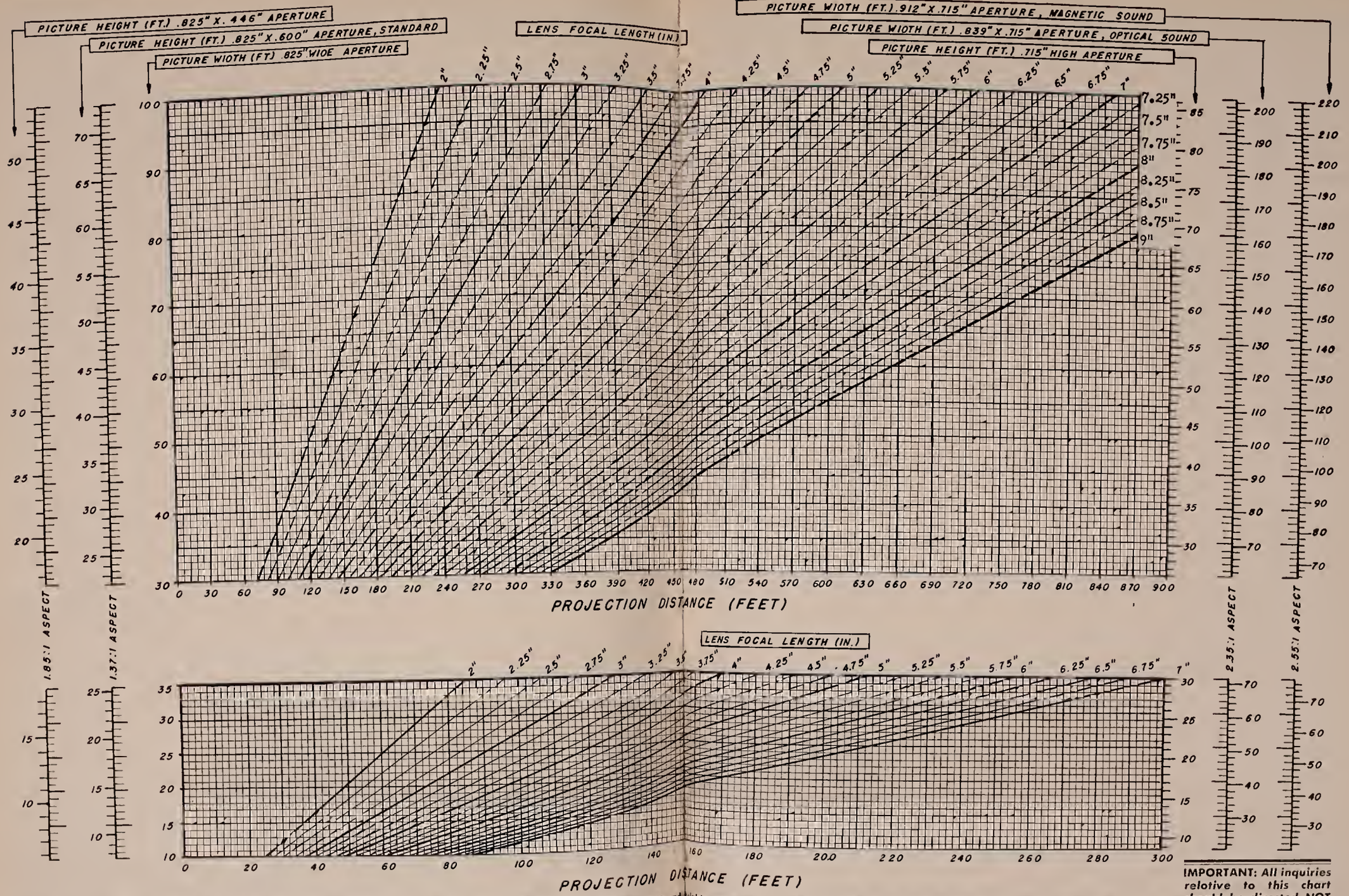
line at this
There you

will read off the following dimensions—a picture width of 70 feet and a comparable picture height of 51 feet.

For calculating wide-screen dimensions, use the table at the right-hand side of the chart. For picture widths of less than 35 feet, use the lower section of the chart.

IMPORTANT: *All inquiries relative to this chart should be directed NOT to Kollmorgen but to IP at 19 West 44th St., New York, 36.*

KOLLMORGEN LENS-SCREEN SELECTOR CHART: Lens Focal Length, Picture Width and Height



This chart is unique in that it is scaled not only for both magnetic and optical sound reproduction, but also for both the standard and wide-screen apertures—another IP "first"!

Here is a typical example of how best to apply this chart to an actual projection operating condition: with a standard aperture, you have a 4.25-inch (4¼) focal length lens and a projection "throw" of 360 feet. So, to find the correct picture width and height, you need only to enter the chart at the 360-feet projection distance ("throw") and use the follow-up line to where it meets the 4.25-inch focal length diagonal line.

Lay a ruler or straight-edge on the horizontal graph line at this intersection and follow the line to the left-hand figures. There you will read off the following dimensions—a picture width of 70 feet and a comparable picture height of 51 feet.

For calculating wide-screen dimensions, use the table at the right-hand side of the chart. For picture widths of less than 35 feet, use the lower section of the chart.

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Low-Down on Silicone-Treated Cloth for Various Projection Room Uses

SILICONE-TREATED cloths represented as having a wide variety of useful applications in the projection field have been the topic of numerous letters received recently by IP, so much so that IP feels impelled to express its opinion as to the various uses of this product suggested by the manufacturers thereof.

IP has had tests made of such cloths on film, phonograph records, the film gates of projectors employing high-intensity arcs, and various other units found in projection rooms, in addition to the treatment of film under special conditions. These cloths cannot harm, nor help much, release prints unless too much moisture is applied to the cloth, and it may be useful to prevent, or at least minimize, the "sticking" of "green" prints. However, if the film is not wiped in a *continuous* manner, there appears to be a tendency for such cloth to leave an oily streak or mottle on the surface.

Under no circumstances, however, should silicone-treated cloth be used on raw stock or on negative or master-positive printing films.

Use on Lenses Prohibited

IMPORTANT TO PROJECTIONISTS: *The use of silicone cloth on camera or projection lenses is absolutely prohibited.* All lens manufacturers warn against such usage on coated lenses for the simple reason that a layer of silicone or any other kind of grease or oil interferes with the proper optical functioning of the magnesium fluoride anti-reflection coating. Such coatings are designed to work efficiently with glass on one side of them and air on the other.

The use of silicone cloth neither guards against the brittleness of film nor fading of the photographic image. The statement that the cloth adds "depth, brilliance to color or black-and-white film" is unfounded. Silicones are incapable of acting as intensifiers or reducers, though it may be assumed that the removal of dirt from the film improves the quality of the image. Photo filters should not be treated with silicones, especially if the filters are anti-reflection coated.

Not a Dust Resistant

A silicone coating on film or phonograph records does not prevent the collection of dust. In fact, dust adheres more readily to silicone-treated film than to clean, dry, unlubricated film. The film of silicones applied by the cloth is not "tough" but very similar to a film of ordinary grease or heavy oil. Silicones spread to a greater extent than ordinary greases, however, and feel "dry," rather than oily, because of their powerful moisture-repellent properties.

Probable Useful Application

A silicone film is removed more readily by film-cleaning liquids than is an oil film. Actually, the ease with which silicones are dissolved by hydrocarbon oils and greases render them very impermanent as movie-film coatings. In ordinary use, release prints come in contact with the oil used for lubricating projectors. The presence of oil removes the silicones with amazing rapidity.

It seems that the most useful appliion of the cloth lies in the direction of lubricating the sprocket-hole *edges* of green prints, waxed or unwaxed. A silicone coating on the film margins of new prints (emulsion-side only) would materially reduce the likelihood of "sticking" in the projection gate, and is superior to the use of ordinary oil because it would not "spot" the picture and soundtrack areas to an appreciable extent. Unfortunately, however, such cloths do not readily lend themselves to the coating of the perforation margins only. Some kind of simple applicator device would be a minimum requirement for this job.

Lubrication of gate runners and tension-pad surfaces with a silicone film may possibly be helpful when running green prints, especially unwaxed ones; but the silicones would undoubtedly vanish after the passage of 50 to 75 feet of film, and be removed almost instantly by only a few feet of oily film.—JAMES J. FINN.

So... You Project-Film Guys Have Worries?

Here are excerpts from a recent column by Dan Parker (our favorite sports writer) in the New York Daily Mirror. *So prophetic are these observations, conveyed in faultless journalese, and so apropos the present plight of Hollywood moguls who are torn betwixt and between the devil and the deep blue, that we couldn't resist sharing them with the relatively few who are blissfully unaware (for the moment) of Hollywood's prime interest.*

COMMISSIONER Ford Frick announces the engagement of a research bureau to survey all problems confronting baseball, obviously to find the cause of declining attendance. I would say this was a sheer waste of money; but since the Commissioner's coffers bulge with what it takes, the study can be put down as a harmless extravagance—*unless* it comes up with a report that the fans are for pay-as-you-see Tv.

Baseball, after all, isn't a religion or a way of life, as some people would have you believe. Nor should it be a medium for encouraging America to spend most of its time drawing up before a Tv set and opening a bottle, can or keg of Schmaltz's cool and refreshing beer with one hand, while lighting up an Unlucky, or a Black Vulture, with the other.

Strayed From "Basic Ideal"

The reason that surveys are now deemed necessary to find out what's wrong with baseball is that it has *strayed so far from its ideal.*

The Tv menace crept up on the money-hungry magnates while they were so blinded by its glitter that they couldn't foresee what they were doing to the minors by supplying competition *in territory they formerly couldn't invade.* What a mountain of woe they were building up for themselves when the "friend" that provided them with such great sideline revenue was developing into an octopus that was fastening its tentacles around them!

The game, meantime, has lost prestige through letting itself become a medium for tobacco and alcoholic beverage advertising that could have a bad effect on Young America.

Television has reduced boxing practically to a studio proposition controlled by one outfit. Now baseball seems to be plunging toward the same fate. With the minors decimated and the crop of young ballplayers diminishing annually, major league fans are drifting in droves to Tv too.

Booby-Trap in the Making

Now the magnates propose to bait the trap for themselves by turning to pay-to-see telecasts of their games. The next step would be empty parks, and that would bring baseball abreast of boxing in its plunge into oblivion. Having trained a generation of fans to get their baseball free on Tv, the magnates responsible for all this aren't going to get them to pay eagerly through the schnozzle attachment on the living room Tv for something they had been led to believe came with the set.

What Commissioner Frick should do is cancel that survey and hire a psychiatrist to listen to the wails of his harassed magnates, stretched out on the flat of their backs like the game itself, as they examine their guilty consciences.

The Ole Crank-Twister Considers 'Asback' Ratios

The second in a series of effusions, apparently meaningless but actually purposeful, by the self-appointed Dean of USA projectionists.

THIS is to officialy notify you and the industry that the way 'asback' ratio is being handled is all wrong. We, "The Society of the Star and Cam," have decided to change it all around. Our Society, as you should know, is fully qualified and authorized under our by-laws to put this over on the industry. Moreover, it is restricted to the high-intensity intellectual members of our L.U., and *gin*erally regarded as a sorta "Whose Who" to the profession. So, this removes no dout about the legality, and leaves even less dout about our standing — if able.

At a recent meeting of the Society, "Flicker" Toggelink, our chairman, was, as usual, maintaining proper parlementry decorus with a pair of 10-inch pliers. Incidently, Flicker is the invinter and mfg. of the famed "Dazzel-Lite" shutter (patent applied for). By the simple and ingenious expedient of hack-sawin off the anti-flicker blade of a two-wing shutter, he changes it into a one-winger. The increase in light output with the Dazzel-Lite is simply astonishin — being in the order of 50% gain over the soon to be obsolete ordinary two-winger.

'Prince' of Projectionists (Who Said That?)

But to get the main feature back on the screen. The principal speaker of the occasion—that Prince of Projectionists (the Ole Crank-Twister, of curse) was assisted (how else?) up the main isle by two of the *younger* members of our local, both 1914 men. Ole Twister began his revelations by expressing sincire regrets to the assembly for being unavoidably detained for 1 hour, 40 minutes beyond his scheddled time. Appears that he met an old friend at Marty's bar, because he had not seen this old pal since the days of Koster and Bials Music Hall, a nostalgic reunion had followed.

Resplendent in his emblem of "Fellowship" rank in the Society (a platinum-plated star and 2-pin cam taken from Edison's Exhibition Model Projectorscope) Old Twister read a paper, the title of which he insisted upon pronouncing as "Asback Ratios" (courtesy of Hollywood guys who never ran a projector). This quaint pronounciation was no doubt due to a little difficulty he was having with his artickulashun brought on by he-cups.

"Absolute" on the Level

It's just no use tryin to tell all Ole Twister said because he digressed at times from the prepared text into the realm of the penultimate projector and its relatunship to present-day phantasmagoria. Now, this subject is divisionist, since it tends to seperate the projectionist from the moving picture operator — so the less said about it the better.

The guts of the paper was to the effect that since all asback ration funkshuns are based on a "absolute horizontal throw," and since there ain't no such show-shop anywhere, then the present system is un-reelistic. (Off the record, mind you—just for the novelty, and with no precunary motives, Ole Twister offered to work any such job as cheap as $750 per week, if one could be found outside the Hollywood studios).

Since, admittdly, there aint no such thing as a absolute horizontal "throw," then cropping of the aperature is as certin as a white screen when you forget to set the reel-end alarm. Moreover which verticle cropping is relatively twice that of horizontal. "The vertical demenshun," declared Ole Twister, "is and always has been the *variable*, and the horizontal the *fixed.*" He concludes that "by making the horizontal demenshun equal to unity, aspect ratios cease to be Asback. Thus, 1.85/1 from now on is to be expressed as 1/0.54, and 1.75/1 becomes 1/0.572, *etc.*"

The Society, anticipating no sane opposition to the change, is confident that the shift to the new, and preferred, method will be adapted forthwit.

P.S. Flicker says that if you would put in a strong editorial plug for the Dazzle-Lite shutter, he would see what could be done about fixing you up with a contributing member ticket (financial, of coarse).

FRANK W. MACDONALD
IA Local 199, Detroit, Michigan

New Hilux Lens Series by Projection Optics

The new Super Hilux lens manufactured by Projection Optics, Rochester, N. Y., is designated as having an "*F*:1 light-collecting speed," which term, the manufacturer points out, is not to be confused with the normal "focal length speed" of the lens.

Two years ago, the company states, it decided that a whole new concept of projection lenses was required, primarily because future requirements would involve projecting and transmitting light evenly over a screen size many times greater than that formerly used, and that color correction over such a size would become a most important issue.

"After careful review and intensive study of all known lens types," states Projection Optics, "we completed development of a new lens to be known as the Super Hilux 'F:1 Light-Collecting Speed' ". We feel that this lens represents the optimum in color correction, flat field, definition, contrast and, most important of all, a means for getting considerably better light distribution.

"In the past, optical manufacturers throughout the world have used the *F* number to identify the free aperture opening of a given focal length. However, due to the limited technical knowledge of the public, such identification has been greatly misinterpreted as meaning a 'certain amount of light transmission'. This is not quite the truth, thus we chose a definition which actually can be used to measure a certain performance.

"Basically," continues P. O. Co.. "by measuring the actual amount of light a lens can collect the trade now has a definite guide."

The Super Hilux is available in effective focal lengths from 1.5 to 7 inches in the 2 and 25/32-inch small diameter, and in effective focal lengths from 4.75 to 14 inches in the high-speed, 4-inch diameter mount. Focal lengths from 1.5 to 3 inches, and from 7 to 14 inches will be available only on custom orders. The remainder of these lenses will be carried in stock.

Hilux 264 Fixed Anamorphic

Most recently announced by Projection Optics is a new fixed anamorphic, the Hilux 264 lens for the smaller theatres which sells for $395 a pair.

This lens has the same optical features as the Hilux-Val, except that it is fixed and usable only with a 2 and 25/32-inch or smaller projection lens. The mounting portion has been designed to fit into any standard 2 and 25/32 projector mount, and will clear all accessories on the face of some projectors, the Company announced. It will thread directly on the prime lens, and will never require support brackets or extension tubes.

New PhotoStereo Sound System



Dr. John G. Frayne, chief recording engineer for Westrex Corp., and president of the SMPTE.

Simplicity of design and operation, reduction in equipment costs and complete compatibility mark the stereosound system which is described in the accompanying article.

STEREOPHONIC sound reproduction has been accurately defined as that which in the reproduction process maintains the same spatial relationship of the sound as it existed at the time of recording. This definition was the basis for a photostereo development recently demonstrated and described before the SMPTE by Dr. John Frayne, Engineering Manager for Westrex Corp.

This system was devised to overcome the problem of additional production, installation and equipment costs associated with the several stereophonic systems which were introduced during the past few years. A brief historical review of the development of stereophonic sound is given to clarify the definition of terms involved and provide a basis for comparing the relative merits of the various systems discussed.

Early Stereosound Efforts

We will recall that in 1943 Steinberg and Snow[1] showed that this type of sound reproduction could be achieved with the use of not more than two or three separate channels from microphones to loudspeakers.

As early as 1940, Bell Telephone Labs demonstrated a three-channel system employing three photographic sound tracks on separate film without picture, with highly gratifying results. However, it was not until some years later that the motion picture industry took active steps to incorporate this type of sound in their presentations.

Stereophonic sound, made in accordance with the foregoing definition, was first employed commercially so far as is known by Cinerama in 1952. In this application, five magnetic tracks on separate film were used to produce the stereophonic effect. Following the successful introduction of Cinerama, a three-channel stereophonic system on separate 35-mm film was used in the presentation of 3-D pictures in 1953.

However, since the motion picture studios lacked the time to develop techniques for stereophonic pickup, they usually resorted to the pan-potting of original monaural sound track to obtain the horizontal movement of dialogue across the stage; the result was a pseudo-stereophonic effect. In recording music, the stereophonic technique was employed in most instances.

First "True" StereoSound

The first commercial production using *true* stereophonic sound on the composite print for both dialogue and scoring, occurred in 1953 with the introduction of CinemaScope by 20th Century-Fox. Many pictures in CinemaScope have been produced subsequently by other motion picture studios, but in most cases the dialogue was obtained by pan-potting an original single monaural track.

To obtain the composite release print, four magnetic tracks were striped on the release picture print, and the sound was electrically transferred from a four-track master. Three of the tracks produce the stereophonic effect, while the fourth is used to provide auditorium sound effects.

The foregoing systems required special reproducing facilities in the projection room and backstage. In addition to the three or more separate transmission channels and loudspeakers which were common to all, Cinerama and 3-D used separate sound reproducers interlocked with the projection room equipment. To handle the CinemaScope composite print, a separate "penthouse" reproducer was mounted between the upper film magazine and the picture head. Suitable switching facilities permitted sound reproduction from either the CinemaScope or the standard release print.

Unfortunately, films made with these systems cannot be played in non-equipped theatres and accordingly they must be classed as non-compatible.

Perspecta's Compromise System

In an effort to provide a compromise of these conflicting conditions, Perspecta Sound was introduced in 1954. In this system a single monaural photographic sound track was employed, with three sub-audible frequencies superimposed thereon. These frequencies controlled the relative program level of the reproduced monaural sound into each of the three backstage speakers, thus making possible the movement of the sound across the screen.

This effect is similar to that obtained by the use of a pan-pot in CinemaScope and other systems. While it lessens production, installation and equipment costs, the fact that all of the sound must be moved at one time due to the single pickup, places it outside the definition of stereophonic sound. It affords no possibility of changing the *relative location* of sounds occurring *concurrently*.

At the present state of the motion picture art it is axiomatic that a system, to be compatible, must be photographic and the soundtrack must occupy the same position that is currently standard on the release print. The new track and the standard track must be capable of reproduction in a theatre which is specially equipped as well as in a non-equipped house with a minimum of operational changes.

Two-Channel Possibilities

While three-channel stereophonic systems are widely accepted in the industry today, one should not lose

1 J. C. Steinberg and W. B. Snow, "Physical Factors", Bell System Technical Journal, Vol. XIII, p. 245, April 1934.

sight of the fact that as far back as 1934 Bell Labs scientists pointed out that somewhat comparable performance, particularly so far as angular location was concerned, could be achieved with a two-channel system.

This conclusion was based on the results of a series of carefully controlled experiments which are a matter of record[1]. A two-channel system with a center-bridged loudspeaker channel appeared to offer the maximum performance obtainable from two sound tracks.

In view of the potential possibilities of a two-channel system, it would appear unnecessary and undesirable to place more than two tracks in the space allocated to the single photographic sound track on the release print. The proposed PhotoStereo System was accordingly based on this arrangement. Either two 36-mil variable-area tracks with a 4-mil septum, or two 48-mil variable-density tracks with a 4-mil septum, are employed and are contained within the area allotted to the standard photographic release track.

The two tracks are recorded simultaneously in line and are reproduced in the same manner. Special light valves were developed to record either the two variable-area or variable-density sound tracks in line simultaneously.

Reproduction by New System

For reproduction with the PhotoStereo system, the usual optical system in the theatre reproducers is modified to be similar to that used in 100-mil push-pull systems. A relay lens is located beyond the film and it focuses the scanned areas of the soundtracks on a separator lens. This latter split-lens assembly separates the component light beams and also forms separate images of the exit pupil of the relay lens on the two cathodes of the photocell.

This optical arrangement results in the proper separation of the two tracks and also provides variable intensity of constant areas of light on the cathodes in accordance with the modulation on the tracks. This type of scanning is particularly desirable to minimize distortion during the reproduction of variable-area track.

Each cathode of the push-pull photocell is connected to a separate preamplifier. The outputs of the preamplifiers go through a dual fader and to separate power amplifiers and loudspeakers. The two loudspeakers are located symmetrically with respect to the center of the screen. This is a typical two-channel stereophonic system.

An alternate arrangement has come to be known as a 2½-channel stereophonic system. In it the outputs of the two pre-amplifiers are bridged to a third or "phantom" power amplifier and loudspeaker. The left and right channels are bridged into the center channel with a relative attenuation of 6 db, and with equal levels on the two sound tracks a good balance of auditory perspective is obtained.

Versatility of System

With either system, reproduction of a standard photographic soundtrack is obtained by diverting all of the transmitted light onto one of the cathodes of the push-pull photocell and transferring the output to the center channel in the case of the 2½-channel system, or to the 2 channels equally divided in the case of the 2-channel system. The optical and electrical transfer can be made as a combined operation.

Conversely, the PhotoStereo film can be played in an unequipped theatre with very acceptable quality and without introducing any changes in operating procedures. This would appear to eliminate the need for providing dual types of release prints. The relatively costly electrical transfer to obtain magnetic tracks as well as magnetic striping on the release print are replaced by the standard photographic printing process which is required in some form for the picture in any case.

It is not inconceivable therefore, that with its compatibility and economy features, PhotoStereo sound may become a useful adjunct to the more elaborate stereophonic systems in use in the motion picture industry.

New Single-Phase Selenium Rectifier by Strong

A new single-phase selenium plate rectifier which fulfills all the requirements for efficient operating projection arclamps burning 10- and 11-mm regular carbons and 10-mm Hitex carbons, has just been announced by The Strong Electric Corp. It was developed especially to fill the need of drive-in theatres which require the most powerful projection arclamps but to which three-phase current is not economically available.

This new rectifier incorporates all the proven features of other Strong selenium plate rectifiers, such as moisture-proof selenium units, remote control relay, airflow protective device, large fan ventilator, and taps to provide adjustment to compensate for supply voltage variations through a range of 10% above or 10% below the rated A.C. input voltage throughout the output rating range. The selenium rectifier stacks carry a three-year guarantee.

A new brochure on Strong's complete line of selenium plate and tube-type rectifiers for use with all carbon trims will be sent free to anyone addressing their request to Strong at 31 City Park Ave., Toledo 2, Ohio.

National Theatres Net Up

The consolidated net income of National Theaters' increased $82,665 for the quarter ended March 26 over the 1954 amount. The quarterly figure was $734,133 in contrast to $651,468 for a corresponding period in 1954. President Elmer C. Rhoden noted that the gross income for the half year was up four per cent but attendance sagged eight per cent. "The release of stronger attractions and the diminishing Tv audience in the summer provide an optimistic outlook," said Rhoden.

Columbia Pictures Profit Soars

Columbia Pictures showed an increase of $991,000 in net profit minus income taxes for the 39-week period ended March 26, 1955, compared to a similar span last year. The latest gain totalled $3,655,000 against a $2,664,000 mark for 1954. Earnings per share of common stock after preferred stock dividends jumped $1.25, from last year's $3.12 to $4.37 per share.

SMPTE Drive-in Survey

A survey conducted by the SMPTE of 26 drive-in theatres in Eastern and Midwest states found that the drive-ins could be equally divided between those having screens ranging in size from 40 to 60 feet and 60 to 120 feet. The average screen brightness was found to be 3.0 foot-lamberts, far below the indoor standard of 9 to 14 foot-lamberts. A report on the survey was made at the SMPTE's recent Chicago convention by Frederick J. Kolb, Jr., of Eastman Kodak. The report stressed the need for more projection light at drive-ins.

Belgian Theatre Fire

A fire that began behind the screen recently cost the lives of 49 people. 16 of them children, in a Belgian motion picture theatre.

Optical Terminology

A few simple terms which are invariably forgotten when the need to remember them is greatest. As published in "American Cinematographer," these terms are equally applicable to all forms of motion picture production.

By JOHN ARNOLD

Head of the Camera Dept., M-G-M Studios

THE ADVENT of the various wide-screen processes with their attendant changes in camera optics have reintroduced in many cases problems of resolution, depth of field, *etc.* While these still are puzzling terms to the average layman, they often are not fully understood even by some experienced cameramen.

The definitions and descriptions of such terms as "resolution" and "circle of confusion" are to be found in most technical volumes dealing with photography. Very often these books are not immediately available for reference when the need occurs. This suggests that condensed definitions of these important terms, memorized for ready reference, can prove beneficial to any technician dealing with cinematography. So, then:

DEPTH OF FIELD: The distance between the closest and the farthest points in a scene being photographed, which are considered sharp or in focus, is known as "depth of field"—a term, incidentally, often confused with "depth of focus." Obviously, only one plane—that on which we actually focus—can be considered as in true focus; but we must also establish a certain standard by which it is considered how far "off" this sharpest image can be and still be called "sharp."

Basic Rules for "Field"

We must bear in mind that the depth of field increases as (1) the subject distance increases; (2) the aperture of the lens decreases, or (3) the focal length of the lens decreases. To illustrate, the comparative depth of field of a 28-mm and a 50-mm lens operating at *F*:11 is shown in Fig. 1.

CIRCLES OF CONFUSION: This is perhaps one of the most difficult terms in optics to explain in simple language. When a lens is focused on a single pinpoint, that point registers as a sharp point. In actual practice, however, it is a small, sharply-defined disc.

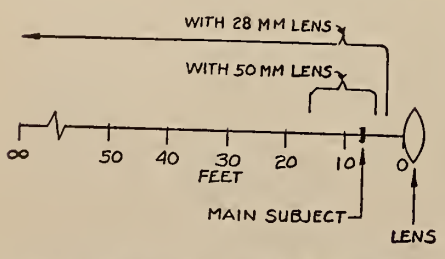


FIG. 1. Comparative depth of field of a 28-mm and a 50-mm lens operating at an aperture of F/11.

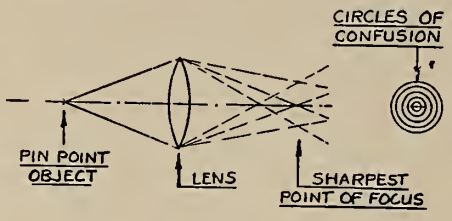


FIG. 2. The term "circles of confusion" is less confusing when illustrated in this manner. Rays of light projecting from point sources either nearer to or farther from the lens than the point focused upon cannot render a point image, but instead result in a circular image made by a cross-section of the cone of light rays, as shown here.

In front and in back of this point there appear rather hazy, larger discs of light which make the "point" somewhat fuzzy in appearance (Fig. 2). This degree of fuzziness is known as "circles of confusion." The smaller the discs appear (the closer to an actual pinpoint), the smaller the circles of confusion.

There exists no *exact* measure as to what degree is acceptable, but this is a relative term used to compare optical correction and to measure "depth of field." It goes hand-in-hand with resolving power in this respect.

"Resolving Power" of a Lens

RESOLUTION: The term "resolution," more correctly termed "resolving power," means the ability of a lens to define images close to each other — sharply and distinctly. This means that a lens with a resolving power of 500 lines per inch will be able to reproduce sharply a drawing of 500 parallel lines each spaced an inch apart.

Getting back, for a moment, to depth of field, we know that the human eye cannot separate details which are in print closer than 1/100th of an inch apart (in a normal viewing distance of 10 inches). Therefore, we consider the "acceptable sharpness" in our field every line (of the aforementioned 500) which is perceptibly sharp and distinct from another line 1/100th of an inch or more distant.

Of course, to achieve this degree of sharpness in a print that is enlarged, let us say, seven times, we must have a lens which has a resolution of at least 700 lines to the inch. Obviously, therefore, we must think in terms of the normal amount of enlargement the lens image on the negative will undergo in order to determine an *acceptable* resolving power.

Projector Archivist -- One of Our Boys

RAY BRIAN is not a promoter for profit of things cinematic; he is not a Ph. D.; he is not engaged in either the production or distribution of motion pictures (which fact automatically attests to his sanity), and he does not contribute erudite (?) articles relating to cinematography to either the "arty" or the weekly hit-or-miss, mass-circulation periodicals. Nor is he the curator of a foundation-financed repository for cinematic memorabilia.

World-Famous Collection

But Ray Brian enjoys personal compensation which, to him, far exceeds anything that might accrue to him through any of the aforementioned activities — an absorbing interest in the art of motion pictures, with special emphasis upon its spawning, its youth, and its venerable present. Not for Ray are the stars, the spangles and the hoopla attendant upon the making and showing of motion pictures today. He's interested in the projector mechanism.

Fitting indeed is this always avid interest in the mechanics of *showing* motion pictures, for Ray works daily in a projection room under the jurisdiction of IA Local Union 434, Peoria, Illinois. In his off-time he has indulged himself in what is truly a labor of love (which may be translated as non-profit) by amassing a collection of records, written and photographed and often buttressed by the actual machines themselves, of more than 350 projector mechanisms. "No," you say? Well stranger still is the fact that of these 350 projectors Ray has photographs of 212!

Craft Cooperation Sought

IP is proud to be the beneficiary of Ray's generosity in making available a catalog of these projector mechanisms which, beginning this month, will be published in a sequence of 25 each issue. Anybody anywhere in the world who wishes to lend a helping hand to Ray Brian in his richly deserved role as a motion picture historian of the first rank

will earn the gratitude of all of us, especially Ray.

Here is the first listing:

ACE—Sterling M. P. Machine Co., New York, about 1920.

ACME—Acme M. P. Machine Co., New York, which evolved into the Simplex-Acme.

ACMEGRAPH—by Jean A. LeRoy, 1906.

ACTOGRAPH—sub-standard 17.5-mm jab.

A. E. G.—German make, 1928.

AGA-BALTIC—Sweden, 1950.

APEX—S. O. S. Cinema Supply, New York; of Simplex Regular design.

APOLLO—made before 1900.

AMERICAN—American M. P. Products Co., 1134 West Austin St., Chicago, Ill.

ALL-AMERICAN—by RCA in 1954 for export.

ANIMATOGRAPHE—Robert W. Paul's second mechanism, in 1896. Used a 7-point star.

ANARITHOMOSCOPE—before 1900.

ANIMASCOPE—made by Owen Eames about 1900.

ANIMATOSCOPE—made by Birt Acres in 1897; used extensively by Lyman Howe for his world-famous travelog lecture-demonstrations.

ARCADIO—British version of the German Mechau continuous projector which utilized a shutter wheel bearing 36 "matched" lenses.

ARTOGRAPH—made about 1900.

ASKANIA—made in Germany in 1950.

ATLAS—Atlas Educational Projector Co., 67 Irving Place, New York, about 1914.

BADGER—Badger Stereoptican and Picture Machine Co., La Crasse, Wis.

BADIZOGRAPH—about 1900.

BAIRD—made by C. R. Baird from 1914 through 1928 (British).

BAUER—made in Germany.

BEACON—made about 1920.

BEARD—R. R. Beard Co., England, in 1910.

BELL—Bell Equipment Co., New York, 1931.

[TO BE CONTINUED]



Changing Aspect Ratios

To The Editor of IP:

I receive a lot of valuable technical info from your articles, having read about the shifting devices used to move projectors when running magnetic or optical reproduction. These, to my mind, are unecessary when there is a much simpler way of remedying the situation.

I filed the top and bottom out from a pair of standard movietone apertures (1/37:1) to meet the Cinemascope height. With these apertures the picture projected is at a ratio of 2/35:1 instead of 2/55:1. They were already masked for a sound track, therefore, Cinemascope magnetic or optical can be run with this aperture.

To set projectors for a standard optical run (not C'Scope) insert the above-mentioned apertures with your C'Scope lens combination to determine how much, and where, filing should take place to meet the horizontal screen masking. Vertical screen masking must be moved due to the ratio change.

You will find the result well worth the effort.

R. C. Koldoff
I.A. Local 297, San Diego, Calif.

Editor's Reply: This solution to the problem of different aspect ratios when changing from CinemaScope magnetic- and optical-sound prints seems to be the most satisfactory way to eliminate masking and projector-centering difficulties. The difference between a ratio of 2.35/1 and a ratio of 2.55/1 is insignificant, although many projectionists feel that the full width offered by the magnetic-track prints should be employed.

Instead of an aspect ratio of 2.35/1, however, Mr. Koldoff is actually obtaining a ratio of 2.31/1 with standard apertures filed out in height. Very careful lateral centering of the aperture is necessary to prevent the narrow "effects" track on magnetic prints from infringing upon the picture area. This is the reason why the regular C'Scope optical-print apertures cannot be used with good results—they are too wide (0.839 inch instead of the standard 0.825 inch).

Du Pont "Cronar" Field Tests

To the Editor of IP:

The April issue of "International Projectionist" reported that the Du Pont Co., in cooperation with Paramount Pictures, was about to begin a field evaluation program of the new "Cronar" polyester photographic film base on *The Country Girl.*

This program is being carried out, and some of these reels now have been projected more than 200 times by various projectionists in a number of theatres. Almost without exception, the projectionists involved have been enthusiastic about the "Cronar" base, and also about the new transparent tape-splicing technique.

The Du Pont Co. reports that this evaluation program is proving of great value, not only in demonstrating the toughness and durability of the new base, but also in pointing up certain improvements which should and will be made prior to the commercialization of "Cronar" films. Du Pont also is happy to report 100% cooperation by all projectionists who have participated in this program, and expresses appreciation to these men for their suggestions and their enthusiasm.

E. Meschter
E. I. du Pont de Nemours & Co.,
Parlin, N. J.

Complete cooperation with everybody having anything of value to offer for the advancement of the projection art has always been a hallmark of craft endeavor. IP is glad to have this basic principle restated by such a reputable organization.

Long Look Into the Future by Tv Trade Journal

Advertisers will spend $3.5 billion on television in 1965, and 65,000,000 sets—most of them resembling pictures hung on the wall—will be in American homes. Sixty per cent of the sets will be in color. Battery-powered, portable color sets, weighing five to ten pounds, will be as easy to carry as a briefcase. Circuits will be printed and tubeless. Sets will be repaired as easily as changing a light bulb. One thousand stations will be linked by three "live" Tv networks, and "tape" networks will be as common as today's radio transcriptions.

This prediction of the state of Tv a decade from now was made this month by *Television Digest*, a weekly periodical published in Washington, D. C.

Radio to Continue Strong

Radio was not ignored in the *Digest's* peek into the future. "U.S. radio homes today total 46,600,000, virtually 100% saturation. There are about 90,000,000 home sets and 30,000,000 auto sets. By 1965, with 58,000,000 homes, there ought to be at least 100,000,000 home and perhaps 50,000,000 auto sets. . . . Radio always will be with us — in home and workshop, in vehicles, in our pockets, on our wrists. And powered by tiny long-lasting batteries, it won't have to plug into wall outlets."

Also predicted was that moviegoing will be an "event" of the nature of "going to a Broadway play, the opera, championship fight, Kentucky Derby, *etc.*" If fee-Tv clicks, the *Digest* stated, neighborhood movie theaters will be wiped out.

New Drive-In Screen Paint

A new drive-in screen paint of the white "Vinylkote" type which can be applied in damp weather by either brush or spray on painted or unpainted surfaces is available from Raytone Screen Corp., Brooklyn, N. Y. One gallon covers 400 square feet, and the paint will dry in one hour, it is said.

An Ever-Changing Process: TV Studio Film Projection

Design of Tv projectors has diverged greatly during the last few years from the familiar mechanisms found in the theatre. This article describes equipment currently being used.

HOW DOES projection at a Tv station differ from that practiced in the theatre? This is a question often asked these days by theatre projectionists.

Tv projection is a constantly changing process. The arclamp, which was once an important part of the Tv film projection scheme, became outmoded by the development of highly-sensitive iconoscope camera tubes. The great majority of Tv films are presented today on 16-mm film by means of 1000-watt tungsten bulbs similar to those used in portable 16-mm projectors, or by means of a pulsating gas lamp similar to the Xenon arc which was described in IP for June, 1954.

Tungsten Light Dominant

Although there has been a trend during the last few years toward the pulsating gas lamp as a Tv projection light source, because its pulsations could be directly synchronized without a shutter to the scanning action of the Tv camera, this trend may now be reversing itself because it is felt that tungsten bulbs offer greater simplicity and economy of operation. By using tungsten bulbs, the complicated equipment required to provide the extremely high voltages needed for the arc-type gas lamp can be eliminated.

However, Tv projection is going through changes even more radical than this. Today, most projectionists and engineers in Tv are full of praise for the flying-spot scanner, a combined projection and camera device which makes it possible to eliminate intermittent action from the film and project a continuous image which is recorded by a photocell rather than by a camera tube. The flying-spot is felt to be the method of the future because it is not only highly efficient in terms of clarity of the transmitted image, but it is also adapted to the projection of color as well as black-and-white.

In a station such as WOR-TV, one of the smaller non-network stations in New York City, projection equipment includes two 35-mm projectors, two 16-mm projectors, one slide projector and one opaque projector. About 80% of all programs are transmitted from film. At CBS, where the New York station operates in conjunction with the master-control center of the entire CBS network, nine 35-mm projectors and nine 16-mm projectors operate along with a large number of slide and opaque projectors.

Small-Station Setup

The operations of these large New York stations are in contrast with that of a large number of smaller stations throughout the country where projection equipment is likely to consist of two 16-mm projectors, one iconoscope pickup camera and a slide projector. The camera, mounted in a chassis containing a preamplifier, is usually stationary, as are the projectors. The projection beam is directed at the pickup camera tube from either of the two projectors by means of surface-silvered mirrors set at angles. These mirrors can be installed so as to slide in and out of position on tracks, if necessary.

Usually, 35-mm projectors are found only in the major Tv stations. There are a number of reasons why 16-mm equipment is preferred in most installations. Building codes, for instance, still insist on much more stringent and expensive precautions against fire where 35-mm projectors are in use because of the possibility that nitrate-base film may be used.

The bulk and weight of 35-mm film is another cause for prejudice in Tv studios. Not only is it difficult and clumsy to store and ship, but 3000-foot reels must be used to hold the content of a 1½-hour program. 16-mm reels can accommodate any conceivable program length likely to be placed on film.

Because of these savings, most Tv projection is on 16-mm, despite the fact that engineers readily admit that 35-mm film gives much better definition and carries a soundtrack capable of reproducing sound with much greater fidelity. Many engineers feel that in years to come the advantages of 35-mm film will counterbalance the present economic reasons for largely ignoring it.

Projector Action Changed

Projectors used in Tv studios differ from those found in theatres in that their intermittent and shutter systems, when they have shutters, must be designed so as to send a larger number of separate film images per second to the pickup tube. In addition, the projector must be synchronized exactly

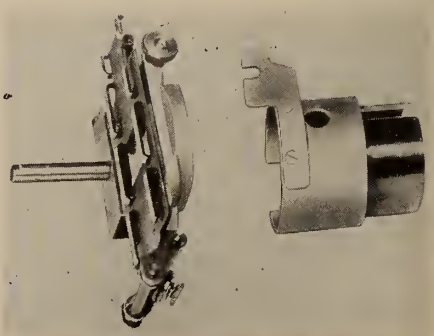
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Wenzel Inner Light Shield

Wenzel Projector Co. has developed a new inner light shield, PRO-55, to be used in conjunction with the PRO-47 front lens focusing attachment for Wenzel PRO-4, Ballantyne "W," Simplex Regular and all regular rear-shutter projector mechanisms. When using the shield, the A-4 or the CW-65 lens mount (depending upon the situation) is removed entirely.

The inner ring slides over the lens barrel, and, regardless of the focal length of the lens being used, the film gate may be operated without interference. The slotted ear fits under the thumb screw on the EW-2, or the upper thumb screw of the E-45. It is made of brass and may easily be bent, if need be, to obtain proper lens alignment.

The EW-78 heavy-duty film-trap door shown here is the new Wenzel triple-tension-shoe type which can be used on any Wenzel or Ballantyne projector, since these mechanisms are already equipped with the Wenzel adjustable EW-2 door holder assembly. Other projectors using the E-45 door holder assembly with the two-threaded holding studs must obtain the Wenzel EW-2 with the single-threaded holding stud.



Wenzel inner light shield, PRO-55

with the waveform generator of the Tv camera which actuates the scanning beam of the camera's pickup tube.

At this point it is necessary to explain why more film images per second are needed and how they are obtained. Tv projectors are sometimes referred to as operating at a speed of "30 frames per second." This a confusing way of describing what occurs because the film does not run any faster through the projector. That would obviously mean that the action of the picture would be distorted, with actors appearing to be running when they were walking—to say nothing of what would happen to the sound.

Shutter Speed Increased

What does happen is this: The film actually moves through the projector at the standard speed of 24 frames per second—but the shutter action of the projector operates as fast as if the film were running through a theatre projector at a speed of 30 frames per second. This added speed is needed because Tv cameras and transmitters are timed to synchronize with 60-cycle A.C. current. Synchronization with the power supply frequency minimizes the effects of 60-cycle hum in the transmitted signal and simplifies the problem of setting up an exact timing relationship between the projector and the various transmitting components.

In theatre projection at 24 frames per second, 48 separate projected images appear on the screen during a one-second interval because the flicker blade of the shutter cuts off the image for about a third of the time that the film is held stationary in the aperture. Thus, each of the 24 frames provides two separate images to the screen for a total of 48.

In Tv projection, 12 additional images are obtained each second by making alternate frames of film provide three rather than two images. This results in a total of 60 Tv images compared to 48 for the theatre projector.

Unevenly-Gaited Intermittent

One method of obtaining the special projector action required for obtaining these 12 extra images per second is by means of an unevenly-gaited intermittent movement which moves each frame of film into the aperture for unequal periods of time—for 1/30 of a second and then 1/20 of a second alternately, rather than a steady 1/24



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of a second. By synchronizing this film movement, which is irregular in addition to being intermittent, to a faster shutter action, it is possible to obain a total of 60 separate film images per second.

The faster shutter action is timed not by a gear relationship to the intermittent pulldown action as occurs in theatre projectors, but to the waveform generator of the Tv camera which controls the electronic scanning beam that whips back and forth scross the pickup mosaic of the camera tube.

Flicker Control

The question of flicker was also important in the choice of the 30-frame-per-second action for the Tv camera. Since the brightness level of the Tv home receiver is considerably higher than that of average motion picture screens (particularly in these days of giant wide screens) and since flicker becomes more noticeable as brightness increases, it follows that the 48-image cycle used in theatre projection might prove inadequate for Tv.

If necessary, Tv engineers could have relied on the light-storage or retaining qualities of the phosphors on the face of the Tv receiver tube to smooth over a slower cutoff cycle, but this would have resulted in some degradation of the image such as occurs when film is overdeveloped and an element of fogginess is introduced into a print.

Designing Tv receiving tubes that would hold the picture longer might have enabled Tv projection to operate at the same shutter speed as a theatre projector, but it would also cause the image on the phosphors to blur and lose definition. Therefore, it can be said that increased speed has a two-fold advantage. It brings the entire projector and camera system into sync with the power supply, and it also reduces flicker.

The Iconoscope Tube

There is, however, one problem that remains to be solved after the shutter of the Tv film projector is synchronized with the pickup camera tube and the film movement is controlled by the unevenly-gaited intermittent. Because the scanning beam of the camera tube records an image at regular intervals, with only the smallest fraction of a second between scanning periods, it must scan the face of the tube during the projector's pulldown when the light is cut off.

The problem is solved by the storage, or image-retention characteristics, of camera tubes such as the iconoscope. This camera tube, one of a variety that have been used in Tv cameras, is particularly adapted for film projection because its pickup surface, or mosaic, holds the light energy deposited by the projector. The scanning beam can pick up a signal even though there is no light hitting the mosaic at that instant.

An additional reason why 16-mm projectors became popular for Tv projection is that they can be synchronized with the camera system without use of the uneven intermittent movement, this because of the shorter pulldown cycle needed for the smaller film image. On many projectors it is possible to synchronize the shutter with the camera and obtain 60 images per second without altering the intermittent movement.

The Flying-Spot Scanner

The latest type of Tv film projector is the flying-spot scanner which is able to project color and requires no intermittent action at all on the part of the film. One of the basic principles of the flying-spot scanner is familiar to all projectionists, and another is known to many.

Roughly, the flying-spot scanner operates as follows: the light source is a small powerful cathode ray tube which projects its beam through continuously-moving film so that the image is recorded by a photocell. In some respects this process is not unlike what happens when film runs through the familiar optical soundhead of a theatre projector.

Another principle of the flying-spot scanner is more familiar in Europe than in America because it makes use of the principle of the Mechau non-intermittent projector, developed in Germany in the 1920's. This was the first technically feasible continuous projector.

Tilting-Action Mirrors

Projectors of this type are based on a complicated optical principle that makes it possible to project a continuous, uninterrupted image of the information contained on the separate film frames. The heart of this system is a large sprocket with a great many small mirrors positioned on its outer surface. These mirrors are tilted slightly as the sprocket moves in relationship to the film, with the result that they can continuously reflect a steady image of the moving film. The tilting action of the mirrors compensates for the motion of the film. As one mirror moves out of line with the optical system, another mirror takes over and reflects the next frame into the optical system, also compensating for the movement of the film by its tilting action.

The continuous projection system used in flying-spot scanners, such as

Research Labs Notes

Production of paper from synthetic fibers has been achieved for the first time. The new paper, said by the Du Pont Co. to be 3 to 10 times stronger than a product manufactured from the conventional pulp of rags, was made experimentally from nylon fiber, dacron polyester fiber, and orlon acrylic fiber.

• • •

"Like an oblong cake with white icing" is an apt description of a new cellular insulating block produced by Pittsburgh Corning Corp. The material, which combines insulation and ceramic finish, is made by placing two mixtures of finely pulverized glass and chemicals in a pan and baking them together. The result is a solidified block in which the white material has risen to the top.

• • •

New dual-grating spectograph is the first to operate with two gratings, enabling specimens to be photographed in two ranges simultaneously, according to Bausch & Lomb Optical Co. Two different spectral ranges gives the instrument a higher degree of speed and versatility.

• • •

Two-inch copper pipe capable of carrying many times the number of simultaneous telephone conversations now possible with coaxial cables, and at higher frequencies than have ever been used in communications, has been developed by Bell Telephone Labs. Called a circular waveguide, the tube can carry frequencies ranging from 35,000 to 75,000 megacycles, up to seven times higher than had been found practical before.

• • •

New lamp which provides Tv studio lighting technicians with more equipment flexibility has been designed by Westinghouse. New design details permit use of lamp in from "base down" to "horizontal" positions, thus removing limitations on placement of theatrical lighting units made necessary by previous models which could be burned in "base down" position only.

a model recently marketed by Philco Corp., embodies this principle, but the idea is simplified and made more practical through the use of prisms solidly joined to each other in a many-sided polygon. This polygon revolves in relation to the film in such a way that the image on one film frame is projected through the optical system by one of the polygon's sides. The film is partially wrapped around the polygon so that each film frame is optically and mechanically registered.

Even Light Level

The system operates in such a way that the light level of the projected image is always the same. As the polygon moves it compensates for the movement of the film, holding the projected image steady but allowing the light level of each frame to fade while the light level of the next frame builds.

In other words, two frames are projected at the same time. While one frame is fading out, another is fading in. The system works in such a way that the level of illumination never varies. If the light level of one frame is 25% of its peak, for instance, the light level of the frame moving in to position will be 75% of its peak. The total is always 100%. Therefore, no flicker and no abrupt transition takes place between each frame of film.

Perhaps the greatest advantage of the flying-spot is that it can be so readily adapted to the transmitting of color film. Conversion is simple: three photocells are used instead of one, and beam-splitting mirrors and filters divide the light into the three primary colors, one color being directed toward each photocell.

Light "in Reverse"

The most difficult aspect of the flying-spot scanner to understand at first is the fact that it works in reverse, so to speak. Instead of light being projected into a pickup tube, a light-emitting cathode-ray tube is used as the light source of the projection system. The light is projected backwards through the optical system, and the film image is recorded for transmission when the photocell registers the light from the scanning beam of the cathode tube after this light has passed through the film.

Something should be said before concluding about sound reproduction from film at Tv studios. It is most important that the widely-used 16-mm projectors have optical sound com-

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ponents of the highest quality so as not to further degrade sound recorded on the inherently-limited 16-mm soundtrack.

Tv sound signals are broadcast from a station to many thousands of different home Tv sets with greatly varying sound systems. The average inexpensive table-model Tv set with a 4-inch speaker tucked away in some odd corner of the cabinet is not made to reproduce high-quality sound. A small number of larger and more expensive models are capable of responding to a wide range of sound signals with great fidelity of tone.

Sound From Magnetic Tape

Although engineers realize the limitations of most home Tv receivers, they still make every effort to broadcast sound of the highest possible fidelity. At the New York CBS station, for instance, the sound for many programs is reproduced from a separate magnetic tape, run through a reproducer that is synchronized to the film projector by means of selsyn motors, as was done in some theatres for a short period a year or so ago.

With the exception of sound reproduction, it is easy to see that Tv projection equipment has changed so rapidly in a few short years that it is becoming difficult to trace the resemblance between it and familiar theatre mechanism. If and when the still-experimental system of recording the picture itself, as well as sound, on magnetic tape becomes a commercial reality, practically all resemblance will have disappeared.

PERSONAL NOTES

RALPH KAUTZKY has been named permanent division manager of Altec's northeastern division, with headquarters at 254 West 54 Street, N. Y. City. Kautzky stepped up from northeastern branch manager in October, 1954, succeeding S. PERKINS, advanced to operating manager of Altec.

Kautzky, a veteran employe of Altec and its predecessor, ERPI, has served in various capacities, including field engineer, field supervisor, and branch manager. A native of Bergen, Norway, he possesses an extensive electronics background acquired both here and abroad.

C. E. WARNER has joined the field engineering staff of Altec Service Corp. in the Virginia, Maryland, and Washington, D.C. area. Warner was formerly associated with Altec as field engineer in conjunction with the numerous CinemaScope-stereophonic installations the service organization made throughout 1953-54.

ARTHUR E. NEUMER of the Wollensak Optical Co., has been elected chairman of the Rochester Technical Section, Photographic Society of America, for the 1955-56 season. He heads a list of officers for next year that includes: vice-chairman, George T. Eaton, Kodak Research Labs; second vice-chairman, William S. Shoemaker, Rochester Institute of Technology; and recording secretary, Alton J. Parker, Kodak Park. James S. Moser, Kodak Park, will continue as executive secretary of the Rochester unit.

Color and its Measurement

Any color can be matched by some mixture of primary red, green, and blue lights, and the proportions required by observers of normal color vision serve as an internationally-recognized specification of the color. These proportions can be found indirectly by means of the spectrophotometer, the basic instrument for color measurement.

The automatic recording type of this instrument draws a curve for each part of the visible spectrum, showing the fraction of incident light reflected (or transmitted) by the color standard. The proportions can also be found directly from a photoelectric colorimeter calibrated by suitable color standards.

N.B.S. Comparitive Data

The National Bureau of Standards has now obtained fundamental physical data needed for the setting of color tolerances, the correct perception of color signals by both the normal and the partially color-blind eye, and the requirements for faithful color reproduction. Color standards, methods of color measurement, and systems of color designation have been developed.

Water-Cooled Carbon Contact for Strong '135' Lamp

A new water-cooled carbon contact assembly available as an optional feature on the Super "135" projection arc lamp, has just been announced by The Strong Electric Corp., Toledo, Ohio. The assembly is also adaptable to any Strong rotating-type carbon arc.

The announcement of this further development in the Super "135" comes upon the heels of several announcements covering a series of advancements made within the short period of less than two months. They included the adoption of 18-inch reflectors, a new long-life positive carbon contact, a removable holder for the heat filter, and forced ventilation of the reflector and reflector frame.

What Do You Know About Carbons?

The second of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data provided by National Carbon Company.

Define the Term "Light"

The dictionary does a rather awkward job of defining light as "the opposite of darkness. . . . the essential of vision", *etc.* It is not until we get into the science of physics that an understandable picture is obtained.

Light belongs to the same family of radiations as sound, heat, radio, X-rays, *etc*: it is a particular form of the radiant energy capable of stimulating visual sensation in the human eye. The manner and form in which light travels through space is not clearly understood. It is known, however, that light is generated one tiny pulse at a time, each pulse the result of an *energy change* within a single atom.

An astronomical number of these tiny light pulses is required to illuminate an object to an easily visible level. Something more than 10 million billion (10×10^{15}) such pulses of white light per second, for instance, are required to provide the same illumination per square foot as a single candle at one-foot distance would provide.

How Does One Measure Light?

The measurement of light in motion picture projection applications is concerned with the specification not only of the *characteristics* of a source of light but also the illumination of an object by *light directed upon it from such a source.*

Relative to the source, interest is centered not alone in the *total* light produced, but in the *brightness* of the source as well. With an illuminated object, interest is in the light-per-unit area in the total quantity of light falling upon the object, and, particularly, in the case of the motion picture screen, in the *intensity* of the reflected light.

What is Meant by "Candlepower"?

The candlepower of a source is the light intensity expressed in "candles". Thus it is proper to state that a particular carbon arc has a "candlepower of 80,000 candles". Particularly with carbon arcs, which emit light in one hemisphere ahead of the crater, the light intensity (or "candlepower") varies with the direction of view toward the source.

It is therefore common to further specify the candlepower with respect to the direction, such as "horizontal candlepower," "axial candlepower," "forward candlepower," *etc.* Candlepower values may be specified for any direction or angle from which the light source is viewed.

"Candlepower," then, is the measure of the light-emitting *power* of the source, without regard to the *area* of the source. Obviously, two sources can be of the same candlepower even though one is much larger in area than the other—in which case the source with the smaller area is said to be the brighter of the two.

The "brightness" of a light source is therefore expressed in terms of *candles-per-unit-area.* The square millimeter (0.00155 square inch) has been chosen as the unit area for expressing the brightness values of carbon arcs. "Candlepower" and "brightness," therefore, are measures of the power of a source to radiate light; and if such measurements are taken in all directions, the source is completely specified.

Why the Term "Candle"?

The "candle" is the fundamental unit of light intensity and is a measure of the ability of a source to radiate light. A source is said to have an intensity of one candle if it be capable of illuminating an object at a particular distance to the same degree as would a standard candle.

The standard candle was originally defined in terms of the open flame of a 7/8-inch sperm candle burning at a specified rate. A group of carbon filament lamps preserved at the National Bureau of Standards (U.S.A.) is now used in place of the sperm candle as the standard units of comparison.

What, Then, is a "Foot-Candle"?

The "foot-candle" is a measure of the rate at which light pulses fall per-unit-area upon a surface. A surface of any area, all points of which are located at a distance of one foot from a source having an intensity of one candle, is said to have an illumination of one "foot-candle". The illumination in "foot-candles" multiplied by the area in square feet of the object illuminated gives the total "lumens" over that area. "Foot-candles" and "lumens" are the units commonly used to express values of the

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projected or incident light on motion picture screens.

What is the "Lumen"?

The "lumen" is a measure of the rate at which light pulses are emitted or received. Since a light pulse is so very small, it would be altogether impractical to relate a workable unit directly to a single pulse. To do so would be like attempting to buy a steak by the atom. A more practical unit (like the pound, for steak) is needed.

The "lumen" has been so chosen after the following fashion: if a source having a candlepower of one candle in all directions be completely enclosed at the center of a sphere of one-foot radius, and if a door of one-square-foot area on the spherical surface be then opened, light pulses will emerge at the rate of one "lumen". The lumen is thus a measure of light flow, just as in electrical units the ampere is a measure of the rate of current flow.

[TO BE CONTINUED]

Improved Projection Prints

Eastman Kodak has developed a new type of perforating machine for motion picture film that will permit a steadier image during film projection. Use of the new machine insures that a larger proportion of film will be more accurately perforated than was possible heretofore. This does not mean, Kodak states, that it is now possible to operate within narrower standards than in the past, but that a smaller proportion of the production will approach the outside tolerance limits. In other words, more of the production will be perforated to lower tolerances.

The shape and positioning of the sprocket holes remain as they have been in the past, and this improvement applies only to the matter of dimensional tolerances.

35-mm Projector Exports Rise

American manufacturers last year exported 1,026 35-mm motion picture projectors, compared with 878 during 1953, it is reported by the Department of Commerce. Exports of 16-mm sound projectors declined to 7,616 last year, compared with 7,700 in 1953.

New Paromel Projector Plant

The Paromel Electronics Corp. is now producing 35-mm motion picture projection equipment, formerly manufactured by the DeVry Corp., at a new plant located at 3956 West Belmont Ave., Chicago. Magnetic sound reproducing equipment is also included in the Paromel line.

Theaters' Best Reissue Bet

Theaters continue to hold a substantial edge over Tv in the cash returns for old movies. The latest indication of this trend was the third reissuing of "Wuthering Heights" which previously drew more money from movie houses than was proffered by Tv. The example set by "Heights" reveals that high-quality revivals always stand a good chance for success but a so-so rerun starts on a shaky foundation.

OBITUARIES

E. Perry Steinkopf, 61, member of Local 288, East St. Louis, Ill., and projectionist for the past 25 years at the Washington Theatre in Granite City, Ill., died last month. He is survived by his wife, a daughter, two sisters, and a brother.

Otto A. Hansen, 76, member of Local 343, Omaha, Nebr. for the past 50 years, died recently. Survivors are his wife, three sisters, and two brothers.

George A. Bee, 62, member since 1913 of Chicago Local 110, succumbed to a heart attack while at work in the projection room of the Midwest Theatre in that city. He is survived by his wife, and a son, who is also a member of the Local.

Joe Leavitt, 69, charter member of Cleveland Local 160, died last month. He worked for many years in the projection room of the Colony Theatre there. Two sons and four grandchildern survive him.

Frank Jiruska, 60, member of Local 191, Cedar Rapids, Iowa, died recently following a cerebral hemmorhage. A former official of the Local, Jirsuka worked in the projection room of the State Theatre in Cedar Rapids until the time of his death. He is survived by his wife and two sons.

Burton Steinhauser, 62, member of Local 373, Terre Haute, Ind., died May 15. A leader in union activities, Mr. Steinhauser served as business representative for Local 373 for 25 years. He was secretary of the Indiana State Association of IA Locals and for many years represented his Local at both District No. 8 and IA conventions. He leaves a son, daughter and a sister.



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LESTER ISAAC: CINERAMA

(Continued from page 16)

attest to the world-wide interest and acclaim accorded this enthralling cinematographic spectacle.

Bouquets as well as brickbats have accrued to Cinerama since its first showing in New York; but one can't laugh off the figures relative to even the first production, "This is Cinerama": attendance of 18 millions and a gross of $30 millions—in only 14 cities!

The road has been long and often arduous from the nickelodeon in Washington to the directorship of exhibition for the most famous audio-visual process ever known. But Isaac wears his present eminence well, and while he cherishes the many honors that have come his way he never flaunts them.

Still a member of Local 224 of Washington, Isaac today holds more than 50 gold life-membership cards in IA Locals. He belongs to a score of technical and fraternal organizations, but he has for the most part, as he puts it, "stuck to his people," his brother craftsmen.

Not 'Me' But 'Him' and 'That'

On a recent visit to his office at the Stanley Warner Management Corp., Isaac was heard to boast of only two things. One was that his son Hank, now 8 years old, was "a really good piano player" who one day was sure to give Rubenstein trouble. Then, pointing to the opposite wall, he said: "Please read that."

"That" was a framed excerpt from the Congressional Record for March 30 last. Under the heading "Cinerama Scores Diplomatic Victories in Near East," and referring to the giant Trade Fair at Damascus, Syria, it states:

> "Cinerama is a notable contribution to U. S. foreign policy. Despite the near-overwhelming efforts of the Soviet Union to dominate (the Fair) with massive displays and extravagant promises, both cultural and economic, Cinerama won hands down."

At a similar Fair held in Bangkok, Siam, the Russians, apprised of the inclusion of Cinerama on the program, promptly refused to participate on the ground that such showings constituted "unfair competition."

"That was the most satisfying reward of all," said Isaac.

Well said and well done, Lester Isaac, a credit to yourself and to the craft.

65-mm Prints from M-G-M

M-G-M announced this month that it is climbing on the big-film bandwagon and will release some of its forthcoming pictures on 65-mm as well as 35-mm prints. It is expected that Metro will utilize theatres where 65-mm Todd AO projection equipment has been installed for special "roadshow" runs of certain films.

exactly what meant by a "weak soap solution." In "hard-water" areas considerably more soap would have to be used than in "soft-water" areas. The soap must be removed with distilled water, or layers will form and become baked by the heat of the arclamp. The only possible way to remove such a deposit would be by volatile solvents.

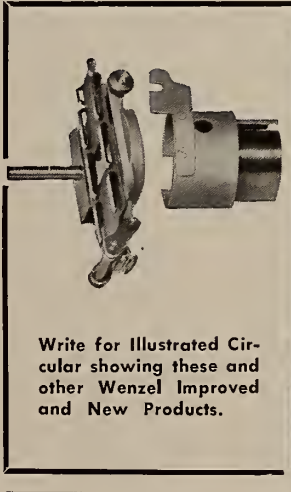
ing, the lens coating, especially on the recoating this element, cleaning, adjust-

The Metro system uses special cameras adapted for 65-mm motion picture film. Prints can be made by contact for the Todd AO projectors, or by reduction for CinemaScope and standard projection, thereby filling the needs of every theatre.

Circuits Against Wage-Hour Law

Employees of interstate theater circuits can expect a substantial delay before Congress acts toward including them under the expanding wage-hour law endorsed by the Eisenhower Administration. Exhibition groups are resisting the recommendation mainly on the grounds that interstate theater employees would have to be paid 1 ½-time for the weekend and holiday work when the theaters are busiest. Congress, which originally proposed the inclusion of the 2 million retail workers under the law, has now decided to make a "serious study" (?) of the plan.

A variable anamorphic attachment for 16-mm projectors is now being produced by Panavision, Inc., which also produces variable prismatic anamorphics for 35-mm projection. Distributor is Radiant Mfg. Corp., of Chicago.



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BLACK-AND-WHITE FILM

(Continued from page 15)

tions necessary for coating the emulsion. Much credit is due to the workmen and supervision who succeeded in coating the panchromatic film in those early days. The operatives were accustomed to red light in the coating rooms, and it was not easy to work in almost total darkness.

First Use of Panchromatic

Panchromatic film was originally supplied in small quantities as experimental material. Some of this was used as early as 1919 by Charles Rosher. In 1923 it became a regular product of the Eastman Kodak Co. One of the first, if not *the* first, regular productions made on panchromatic negative film was *The Headless Horseman.* The cameraman was Ned Van Buren. It was photographed in 1922, and the negative is now in the vaults of Eastman House in Rochester.

The first infra-red negative film was introduced under the name Panchromatic K in 1928 as Type 1210. Infra-red film renders blue skies as black, and green foliage as white, and is used chiefly for the simulation of night effects in pictures taken by sunlight. Very great improvements have been made from time to time in the sensitizing of infra-red film.

The use of panchromatic film became general in the studios by 1927, and tungsten light was being used to an increasing extent instead of arc-lamps, especially for supplementary lighting. In 1928 the Du Pont Company put panchromatic film on the market, and Eastman Kodak Co. introduced Cine Negative Panchromatic II, Type 1218, which was continued on the market until 1935. The year 1928 was, as we shall see later, one of great activity in the production of new types of motion picture films.

Sensitizing Dyes

At this point, it is necessary to say something of the development of sensitizing dyes. Up to 1928, the dyes used for photographic film were those which had been developed by E. Koenig and his colleagues and which had been introduced by the German dye company, Farbwerke Hoechst.

Starting in 1928, laboratories of photographic manufacturers in England, Germany and the United States began to produce new sensitizing dyes at a very rapid rate. A summary of the work in the Kodak laboratories alone can be given by saying that since the beginning of 1930 the sensitizer laboratory has on the average produced *one new sensitizing dye a day!* The use of these new dyes, and especially their use in combinations, made possible a great increase in the color sensitivity of photo material.

Further Improvements

In 1931 Super-Sensitive Cine Negative Panchromatic Film was introduced as Type 1217; it rapidly displaced the 1218 panchromatic film which had been the standard Eastman material for negative making in Hollywood. A faster film known as Type 1227 was made in 1935. This was named Super-X Panchromatic Negative Film. It had a new basic emulsion with ortho-panchromatic sensitizing. It had a comparatively short life, however, because in 1938 a group of new films were introduced characterized by appreciably higher speed and lower graininess.

These new films were made possible by basic developments in emulsion making which affected practically all high-speed films. The new motion-picture negative films were Type 1230, Background X Panchromatic; 1231, Plus-X Panchromatic, and 1232 Super-XX Panchromatic. Of these, Type 1231 quickly became the most popular motion-picture camera film made by the Eastman Kodak Co. It is currently in production and is still our largest-volume camera film. Type 1232 was similar to 1231, except that its emulsion was appreciably faster and coarser in grain. It was the fastest Kodak film made at that date and is still a current product, though the recently introduced Tri-X Negative Film Type 5233 will probably take its place.

[TO BE CONTINUED]

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Manpower Survey Postponed

Plans to aid the motion picture industry in curing the shortage of trained engineers and technicians have been postponed by the SMPTE, it was reported at the Society's Chicago convention. Technical leaders of the industry were said to be too preoccupied with the problems of their own companies to take part in a program which was to determine technical manpower needs and to suggest ways of meeting them.

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DAMAGE TO PRINTS

(Continued from page 8)

sure clamps of the splicing block are opened and the finished splice wiped laterally (*across* the film) with a clean cloth to remove excess cement.

A film splice is actually a *weld*, and a film cement is accordingly a *solvent for the film base*, rather than a mere glue. The two film surfaces dissolve to some extent and melt into each other. A solidly made splice should last for the life of the print, provided, of course, that the perforations are exactly registered and the edges of the film smoothed, if necessary, to prevent catching and tearing in the projector. It often happens that the width of new film is greater than that of old film; and the joining of dissimilar film-widths leaves a small protrusion at the edge of the splice.

A satisfactory splice cannot be made unless the film cement is fresh and the splicing block is in good condition. Film cement should be purchased in stock cans which can be tightly capped. The small bench bottle having an applicator-brush in the stopper is filled from the stock can whenever necessary. Cement absorbs moisture from the air and is eventually clouded by particles of dirt picked up by the brush. Dirty, cloudy cement should be discarded, and the bench bottle refilled with fresh cement.

Accurate Perforation Register

It is unfortunate that the usual type of splicing block is so difficult to adjust accurately. Not only must the perforations register in exact superposition, but the pressure applied to the join be even and sufficiently strong. The metal bar should be kept clean by wiping it with a small cloth moistened with film cement, followed by rubbing with a dry cloth. The bar should never be sandpapered or scraped with metal. Once its flatness is destroyed, strong splices cannot be made.

The pressure springs must be kept free from hardened cement and emulsion scrapings at all times, and properly spaced to insure satisfactory contact across the full length and width of the splice.

Splices in unmodulated, or "silent," portions of sound track may be silenced by painting a sine-wave "bloop" over them on the base side of the film with black movietone lacquer. Unblooped splices produce no discernible click or thump in the speakers, however, when the track contains loud sound at the splice.

Splicing Magnetic-Track Prints

CinemaScope magnetic-track prints require special attention in splicing because the magnetic sound tracks are applied to the base side of the film. The four tracks should be removed from the contact area to effect a strong splice. This may be done either by scraping both stubs (in the manner of double-coated color films) or by applying film cement to the tracks and quickly wiping them off before attempting to make a splice.

Complete removal of CinemaScope magnetic tracks is very important because no film splice can be considered safe unless it holds solidly in the perforation margins. Tracks of this type cannot be satisfactorily blooped to avoid a noise in the speakers when the splice passes over the magnetic pickup head. The smaller sprocket holes of CinemaScope magnetic-track prints require a special splicing block having correspondingly smaller film-registration pins.

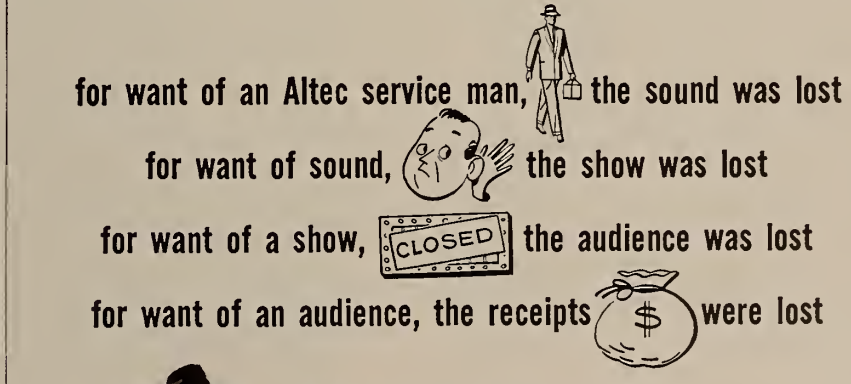
Leaders and Cues

Leaders and cue-marks should be carefully checked in every reel of film because the professional smoothness of the presentation depends to a large extent on accurately-timed changeovers. Every precaution should be taken to avoid unwinding the film on the floor when checking leaders and cues. The top of the rewind bench should be kept free from dust and gritty particles which work their way into rolls of film and scratch the emulsion. Short horizontal scratches which mar the picture and create

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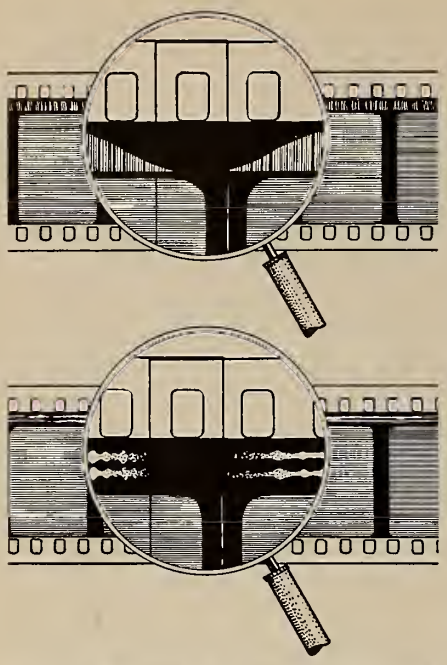


FIG. 3. "Blooping" the sound track at splices to avoid clicks or thumps in the sound. The top drawing illustrates the sine-wave bloop painted in Movietone lacquer over splices in variable-intensity sound tracks. Below is shown the air-brush type of bloop preferred for variable-area tracks.

crackling noises in the sound are usually caused by dirt particles picked up from the rewind bench.

Splices in leaders should be checked for misframes and the insertion of excessively long lengths of replacement film. Loss of footage in the leader only results in the omission of a few seconds of action and speech, and is usually unnoticed by the audience. But a leader which is too long may result in a momentary blackout on the screen when the changeover is made. It frequently happens that replacement leaders contain more than 3 feet of film between the frame marked "3" and the beginning of the picture.

The motor and changeover cues originally printed on the film usually have adequate visibility. It is only very rarely necessary to "score" these cues — that is, to outline the black dots to make them show up on the screen more conspicuously. Hand-scoring never gives neat results, so a regular cue-scoring device such as the Ace or the Signo must be considered as a projection-room necessity.

Common Mutilation Marks

Film is often mutilated by conspicuous scratches, cross-marks, and punched holes intended to serve as cues. When the last 15 feet or so of a reel are spattered with these make-shift cues, it is difficult to know which ones to use.

Loss of footage in the last 12 or 13 feet of a standard release print requires replacement of the original cues with new ones, even though this is properly the exchange's job. Any old cues which may remain must be painted out with movietone lacquer.

Beginning at the end of the film, there should be at least 3 feet of dense black film following the last frame of the picture. Opaque film is preferred to clear film for this runout because a black screen looks better than a white screen should the changeover be missed.

Between the last frame of the picture and the first of the four changeover cue-marks, there should be 22 frames (16½ inches). From the first of the 4 frames having the changeover cue to the first of the 4 frames having the motor-start cue, there should be 11 feet of film, allowing a little over 7 seconds between the appearance of the two sets of cues on the screen.

These distances should be checked whenever a splice is discovered in this portion of a print. If the original cues have not previously been replaced by someone, new cue-marks should be scored on the film with a cue-marking device, placing a cue in the upper right-hand corner of each of 4 consecutive frames. The old cues (as well as any scratches and cross-marks which may be found) should be concealed insofar as possible by carefully painting them out with black movietone ink applied to the base side. Holes punched in the film are concealed by cementing tiny patches cut from black film over them.

Curtain Closing Speed

It is advisable to regulate the travelling speed of the title curtain so that from 6 to 6½ seconds elapse from the time that the curtain-motor switch is thrown to the time that the curtain closes in front of the screen. This timing permits use of the motor cue as a curtain cue. If a longer interval is needed for the curtain to close, an additional curtain cue will have to be placed on the film at the proper distance from the changeover cue on the last reel of film subjects.

A *black* china-marking crayon should be used for marking special cues, as the red ones smear on oily film. These cues should be wiped off with a clean cloth after the last showing of the film. Don't leave this job to the next fellow—he may miss these special cues when inspecting the film and become confused when they appear on his screen.

[TO BE CONTINUED]

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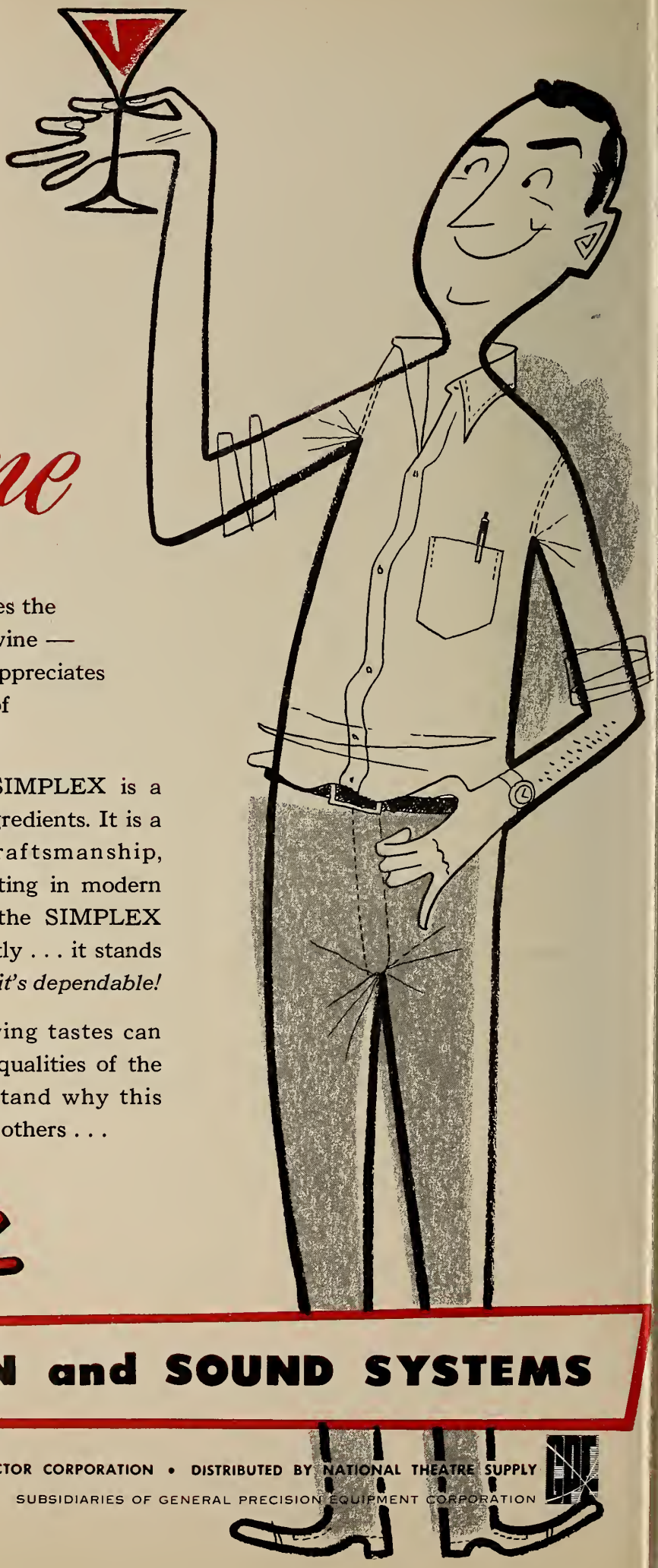
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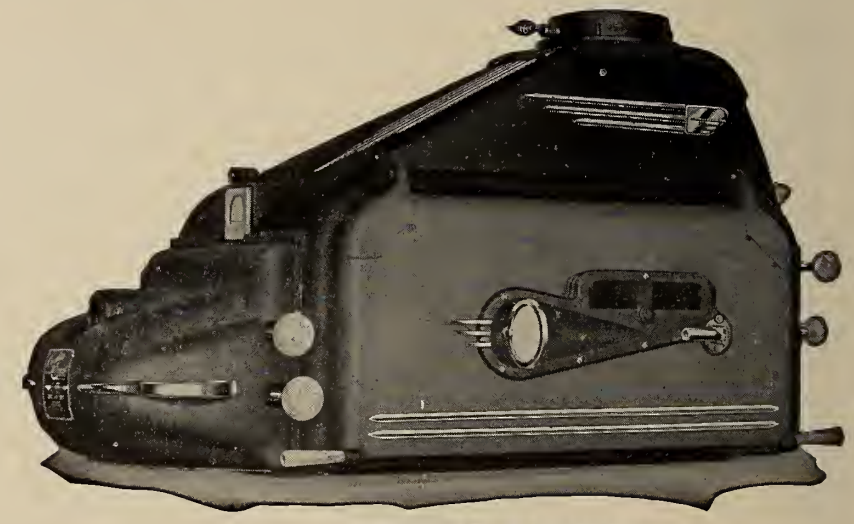
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Volume 30 JULY 1955 Number 7

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9E

Monthly Chat

WITHIN two months IP enters upon its 25th year of service in behalf of the art of projection generally and, more specifically, the projectionist craft. Many discussions have appeared in these columns which were provocative in the extreme, depending upon which side of the road one was traveling — manufacturer or practicing projectionist. IP is proud of the fact that never in its existence has it ever denied the full and free use of its columns to anybody who had anything interesting to say about the projection process.

The past two years have witnessed, perhaps, the most rugged expression of opposing viewpoints, due undoubtedly to the sudden switch of the industry to new production and exhibition processes. Practically every phase of visual and aural film production and projection — from negative film stock to cameras, through the distribution channels and especially relating to exchange practices, right down to screen reflectivity — all aspects have been worked over in these pages.

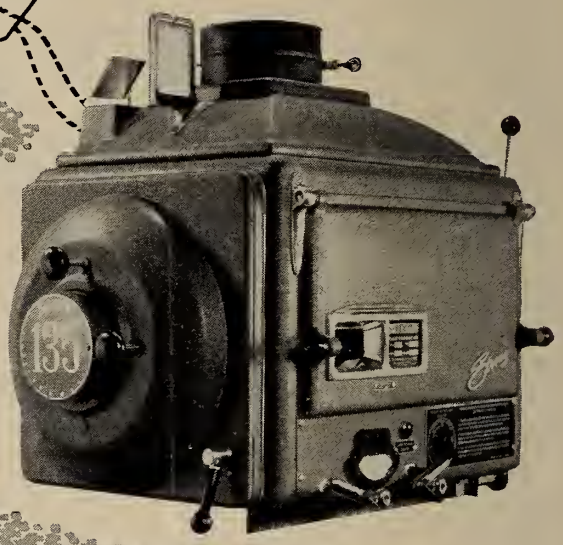
Through the years IP has not always been on the right side of these discussions, alas, but it has always tried to be accurate and has always permitted the widest possible latitude in the matter of expressions of opinion. This policy will continue, of course. We would wish that our readers were a bit more vocal with respect to written expressions relative to IP's content, but we are consoled by the knowledge that we have only to make a slight "bull" (and we've made them) to induce a flock of mail. This is good for the craft and for IP, and we shall always encourage the practice.

AT a recent gab-fest among three manufacturers of projection equipment and several knowledgeable projectionists, two of whom with approximately 40 years' experience in the craft and who are responsible for projection in scores of theatres, the talk inevitably turned to the inescapable topic — how present practice results in our "burning up the film." It was agreed, of course, that in pouring on the light we produce heat. But, it was pointed out that *we* asked for more powerful carbons, bigger lamphouses, bigger mirrors, faster lenses, and bigger pictures, and now that *we* have what we asked for it is up to *us* to do something about it. But that *something* should be that or those things which are reached by mutual agreement and concerted action.

One participant in the discussion said "Sure, the heat embossed the film and caused buckle, making good focus very difficult, but this was only half the story." His notion was that the damage to the film was done after only one or two runs. not by extended playing time. Thus, he continued. his idea was that the manner in which the film *enters* the gate and its positioning while in the gate, a strictly *mechanical* problem of precise tension, was of extreme importance, film embossing or no.

Sad it is that such meetings could not include 50 manufacturers and projectionists. It could happen. and IP will never stop trying. But, apparenly, the writers of complaining letters to IP prefer to fight the battle at long range.

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INTERNATIONAL PROJECTIONIST

VOLUME XXX JULY 1955 NUMBER 7

Projection Lens Terminology

"F:1 Light-Collecting Speed," F Numbers, and T Stops

By Dr. K. PESTRECOV

Research Professor of Physics, Boston University

As a lens designer and an optical consultant, the writer has been following closely the recent developments of projection optics and has participated in some of them. It is gratifying to note that due to the efforts of many manufacturers and their willingness to assume very heavy research and engineering expenses, the projectionist has now a wide selection of projection optics which are better corrected and deliver more light to the screen than those available just a few years ago.

In view of this outstanding record —and considering the fact that new products can be readily promoted on the basis of their factual merits—it is regrettable that a lens maker has now decided[1] to designate a series of new lenses as having an "*F*:1 light-collecting speed." This designation has no scientific significance until it is *rigorously defined* and generally accepted as valid and not contradicting established standards.

The premise for the aforementioned announcement is that "due to the limited technical knowledge of the public" the designation of lenses by *f*-numbers has been greatly misinterpreted. This argument is basically fallacious because the general public cannot be expected to understand every technical term. On the other hand, those active in a certain field of science or engineering, and its application, are required to exercise sufficient mental effort to become familiar with the technical terms generally accepted in the field of their professional interest.

Many Diverse Designations

The problem of designating lens speed is as old as lenses themselves, and a comprehensive review thereof is not within the scope of this article. Suffice it to note that since the middle of the last century, when photographic and projection lenses acquired a most important place in modern technology, many systems of stops (or of speed rating) were proposed, used, and abandoned.

Among these were: the aperture-number system (frequently used by German manufacturers); the Paris Congress (1899) system; the uniform-stop system (Royal Photographic Society, 1881); the system of intensity numbers (Carl Zeiss); the Stolze (Goerz) system, and several others which used *arbitrary* numbers to designate the speed of lenses. Throughout the world, practically all these systems have finally yielded to the *f*-number system, which uses the basic physical and mathematical relationships determining the illuminance in the *focal plane* of a lens, and which is a measure of the *nominal axial* "speed" of a lens.

The words "nominal" and "axial" are emphasized because, as is properly stated in the aforementioned announcement[1] the *f*-number does not take into account the light losses in the system and its vignetting characteristics. Thus, if one lens of a given *f*-number has relatively small light losses and covers a given format without substantial vignetting, its *effective* speed may prove to be much higher than that of another lens of the same *f*-number and covering the same format, but having substantially *greater* light losses and vignetting.

This situation was particularly disturbing when the optics were not coated to prevent reflection losses, and when optical designers were readily sacrificing the off-axial illuminance in order to achieve a better over-all correction of aberrations.

The 'T-Stop' Concept

The shortcoming of *f*-numbers has been remedied somewhat by the concept of the *T*-stop, which has been introduced and generally accepted[2 3] after an extensive and thorough study of all the pertinent factors by experts in the field of theoretical and applied optics. The *T*-stop designation takes into account the light losses, and it is a *true* measure of the axial speed of a lens. Allowing for the unavoidable minor tolerances for measuring errors and numerical designation, all lenses of the same *T*-number have the same axial optical speed.

The *T*-number still does not take

into account the vignetting characteristics of lenses. There is no other rigorous method of expressing these characteristics, except by presenting a curve of the *relative* illuminance within the intended field of coverage. If, however, one wants to obtain a measure of the "effective" *T*-number (or speed) of the lens within its *entire* field of coverage, he may by the process of integration or summation and averaging compute the integrated or average "area weighted" *T*-number.

'Average' Evaluation Insufficient

Some manufacturers actually use such an evaluation for their own technical purposes, and isolated attempts have also been made to designate lenses by such "average" *T*-numbers instead of *f*-numbers or axil *T*-numbers. These attempts have not met with a favorable reaction, because the critical user interested in the vignetting characteristics of a lens cannot determine them from the average *T*-number and he still needs the relative illuminance curve for their determination. Furthermore, if only the "average" *T*-number is given, the user loses even the important basic information as to the *actual* speed of the lens in a part of the field near the axis.

It seems that the proposed designation of "light-collecting speed" necessarily involves a concept similar to the "average" *T*-stop. Therefore, the same objections should be voiced to the "light-collecting speed" designation as to the "average" *T*-number designation. Neither of them indicate the *actual* axial speed of the lens and its vignetting characteristics.

New Terminology Needless

Another even much stronger objection is to the selection of the symbol "*F*:1" for rating the "light-collecting speed" of the new lens. Since it is hardly possible that the actual axial speed of the new lens is as high as *T*—1.0, and that on top of that it has practically no vignetting losses, it seems evident that an entirely *arbitrary* basis has been used for the "*F*:1" rating. No technical justification can be presented for using an arbitrary basis, particularly considering the extensive and costly efforts of manufacturers, of government agencies, and of others to effect standardization of optical terminology, practices, and equipment.

It would be a pity if the remarkable progress, achieved by such organizations (just to mention a few) as the American Standards Association, the U. S. Air Force, the Optical Society of America, the American Society of Photogrammetry, and the Society of Motion Picture and Television Engineers in the field of national and international standardization, be hampered or reversed by the introduction of new concepts, the need for which does not exist and the meaning of which is obscure.

A manufacturer may think that the use of a designation which implies an unusually high speed for a lens would have a definite promotional value. Even this value is extremely questionable because other manufacturers may follow the lead, and, with equal lack of justification, use "better" designation such as "*S*:0.8" or "*T*/0.4", or what not.

It is hoped that this will not be the case, because technological and commercial advantages cannot be permanently secured by terminological chaos, and the user will ultimately revolt against it.

It is quite possible that the announcement discussed herein actually described a lens *T*—1.0 or faster, which covers the motion picture frame with insignificant vignetting. If this should be so, the author would be thrilled to know about such a lens, and then he would withdraw all his objections except one:

That the existing standard concepts and terminology are entirely adequate for establishing the *f*-number, the *T*-stop (axial or average) or even a properly defined "light-collecting speed" of any lens that can be conceivably designed.

———

[1] New Hilux Lens Series by Projection Optics. International Projectionist, Vol. 30, No. 6, p. 23; June 1955.

[2] Military Standard: "Photographic Lenses." MIL-STD-150, 23 October, 1950.

[3] American Standard. "Aperture Calibration of Motion Picture Lenses." ASA PH22. 90-1953.

More Optics Data

SPHERICAL ABERRATION: In an uncorrected objective lens system, the rays from the center of the object which pass near the edge of the lens are bent more sharply than those passing near the center of the lens, and in consequence are brought to focus at a point nearer the lens itself. If the center of the object is a bright point of light, its image appears as a similar point, but surrounded with a blurred circle.

COMA: This is similar to spherical aberration, but of a non-symmetrical character affecting images of points not at the center of the object. The blur of each image point in this case is not a circle, but a tail like a comet (hence the name) extending toward or away from the center of the image.

ASTIGMATISM: Astigmatism, like coma, affects only the images of points off the optical axis. It is the tendency to image the object point as two short lines, mutually perpendicular and longitudinally displaced from each other. Between these two lines lies an "image," or blur pattern of minimum size.

CURVATURE OF FIELD: In the simple case, curvature of field occurs when a *flat* object is imaged on a *curved* surface, usually concave with respect to the lens. Sometimes this aberration can be overcome by curving the object itself, as in the case of the curved slit used in sound reproduction, or the curved surface of a television tube. Curvature of field is usually accompanied by astigmatic differences.

DISTORTION: Distortion occurs when the magnification of the system is not *uniform* across the entire image. If regions near the edge of the object are magnified more than those near the center, "cushion" distortion is present, so called from the appearance of the image of a square or rectangle. If the reverse is true, the phenomenon is called "barrel" distortion.

Optical systems generally suffer, to a greater or lesser extent, from all these aberrations in combination, plus color aberration in the case of white-light illumination. The problem of the optical designer is to reduce them to a minimum, and how well he has succeeded is evident in the really excellent lenses available today to the motion picture theatre field.

Selenium Rectifier by Strong

A new brochure on selenium-type rectifiers, by The Strong Electric Corp., for use with high-intensity projection arclamps is now available from any National Theatre Supply branch.

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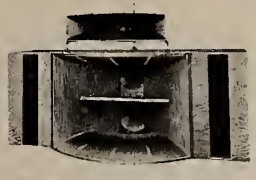
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TYPE PL-312A—Speaker System



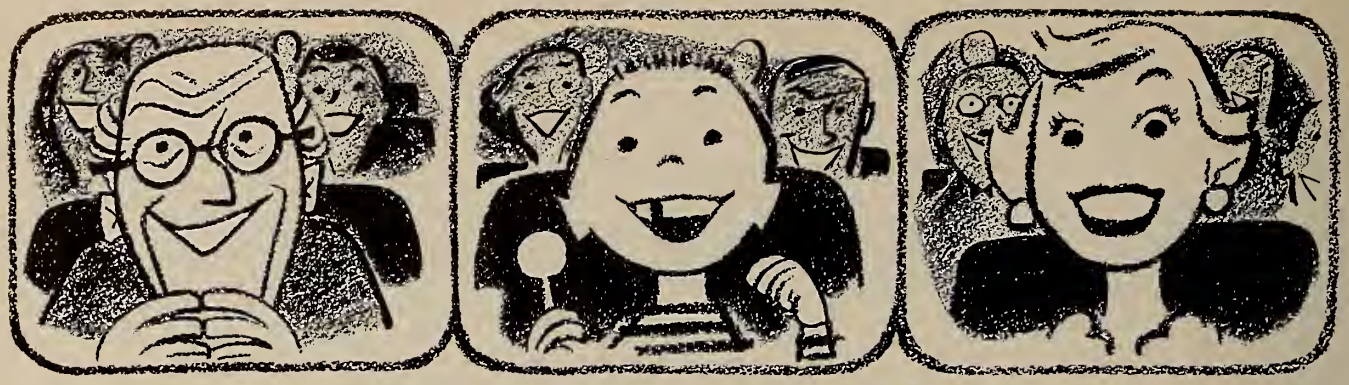
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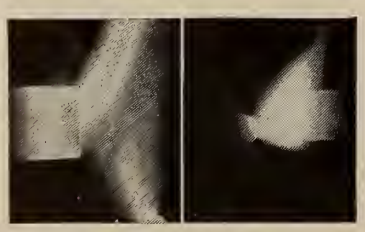
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Prevention of Damage to Prints

By ROBERT A. MITCHELL

II. Conservation Measures in the Projection Room

NO ATTEMPT should be made to clean full-length rolls of film in the projection room. Prints that are oily and dirty cannot be cleaned effectively and without injury except by the use of film-cleaning machines. Very few theatres possess machines of this kind; and merely wiping the film with a dry cloth at the rewind bench does nothing but redistribute the oil and scratch the emulsion with gritty particles collected on the cloth.

The cleaning of prints is the responsibility of the film exchange. The job is best done by apparatus having plush-faced scrubbing wheels which gently buff both sides of the film as it passes through a small tank of film-cleaning fluid such as carbon tetrachloride. The film is thus scrubbed and rinsed at the same time; and the liquid is discarded and replaced with fresh fluid as soon as it becomes dirty.

Short rolls of film may be cleaned in the projection room by drawing the film slowly through a folded soft cotton cloth moistened with film-cleaning fluid. There are a number of suitable fluids. Carbon tetrachloride is probably the best, particularly for CinemaScope magnetic-track prints. A half-and-half mixture of carbon tet and gasoline is also good.

The cotton pad must be kept moist with the fluid at all times, and the surface changed frequently to avoid accumulations of dirt which might abrade the emulsion. The film must be rewound very slowly to permit complete evaporation of the fluid which, if wound into the roll, might spot the film.

Carbon-Tet's Lethal Properties

The treacherously poisonous nature of carbon tetrachloride must be guarded against when cleaning film. Carbon tet can kill! Headache and nausea are a first warning of carbon tetrachloride poisoning. Prolonged breathing of the fumes, or continued absorption of the liquid through the skin, may result in fatal illness.

Film cleaning should therefore be done in a well-ventilated room, preferably by an open window. Special precautions should also be taken when using gasoline or cleaning naphtha. The vapor of gasoline is heavier than air and tends to sink down to the floor where it mixes with air to form a highly explosive mixture in unventilated rooms. Besides doing a better job, film-cleaning machines decrease the risk of poisoning and explosions.

Brand-new, or "green," prints fresh from the processing laboratory pose a special problem on account of their tendency to "stick" in the heated gate of the projector during the first few showings.

The emulsion of fresh film is comparatively moist and much softer than that of old, seasoned film. The heat of the gate melts the emulsion along the perforation margins of a green print, and some of the softened emulsion collects on the surfaces of the steel runners, especially in the vicinity of the aperture. Here the gelatine, gummy and sticky at first, is baked to bone-hard deposits which interfere with the movement of the film and are difficult to remove. These deposits must be scraped off after each reel. For this purpose a piece of copper or brass must be used. Never use steel, which scratches the polished runners. Scratched runners aggravate sticking and abrade the emulsion of new prints.

A sticking print passes through the projector gate with a loud chattering noise. The film alternately holds too tightly, straining or even tearing the perforations, and "overshooting," or slipping down until stopped by contact of the upper edges of the perforations with the intermittent-sprocket teeth.

Overshooting gives a projected picture that jumps violently. Examination of the print after projection reveals deep abrasion along the line of perforations even when the perforations themselves have escaped mutilation. The abrasion is caused by contact of the perforation margins with emulsion deposits on the gate runners.

Sticking may be minimized by reducing pad tension over the aperture, while overshooting can be prevented by drastically increasing pad tension. This should never be done as it ruins the print. Users of certain European projectors can utilize the velvet-covered film runners provided for this purpose. Velvet runners are the best safeguard against the sticking of new, unwaxed prints. Why these have never been supplied for American projectors is a mystery.

Only adequate lubrication of the perforation margins of the film prior to projection can wholly prevent sticking in projectors not supplied with either velvet runners or water-cooled gates. As an emergency measure during projection, many projectionists apply a small quantity of machine oil to the perforation margins as the film feeds into the mechanism. The oil is best applied with two fingers in order that both margins may receive lubrication at the same time on the emulsion side of the film. To alternate the application of oil from one margin to the other will cause side-weaving of the picture.

The exchanges do not like to have projectionists oil the film because the oil eventually works into the picture area where it spots the film and collects dirt. From the projectionist's standpoint, the oil vaporizes in the hot gate and condenses as an oily fog upon the rear element of the lens, spoiling the clearness and contrast of the picture. But there is no doubt whatever that sticking is more harmful to new prints than a little oil.

New prints are usually waxed by the



"Runoff," as illustrated, is a common type of film damage that occurs when the film jumps a sprocket because of a stiff splice or some other reason. Long lengths of film are often damaged when the "needled" sprocket teeth cut holes in the soundtrack and picture.

processing laboratory before sending the rolls to the exchange where they are assembled and mounted on shipping reels. The waxing machines apply a thin coat of carnauba wax to the perforation margins on the emulsion side of the film. A few laboratories use substitute waxes. Some employ the more expensive process of lacquering the entire emulsion surface with a microscopically-thin film of plastic.

Waxed prints do not always run satisfactorily. A deficiency of wax permits sticking to occur; too much wax melts off and collects on the runners, tension pads, and sprockets. The use of plastic lacquer is also open to objection. It curls the film and makes it more likely to fracture when sharply bent.

Oiling 'Green' Prints

The writer recommends a somewhat different method of oiling "green" prints in the projection room. Lay the reel down on the bench and wipe the exposed sides of the roll with a small cloth pad lightly impregnated with medium-heavy machine oil. The pad should be moved to follow the curvature of the film convolutions. When one side of the roll has been oiled, the reel should be turned over and the other side oiled. Enough oil gets onto the perforation margins to prevent sticking, and there is little danger of messing up the picture and soundtrack areas.

Only green prints that have never been projected should be lubricated. Never oil a print known to have been used in another theatre unless it sticks during the first run.

In place of the cloth containing oil, silicon-impregnated cleaning cloths may be used for lubricating the edges *(only the edges!)* of green prints. Slight dampening of the silicone cloth is necessary to release the silicone oils, but excessive application of water should be avoided.

The lubricating effect of silicones is less permanent than that of ordinary hydrocarbon oil, for oil quickly dissolves and removes silicones from the film. However, by the time the silicones have been removed by contact with traces of oil on the gate runners, pads, and sprockets, the print will probably be "broken-in" sufficiently to run without the need of extra lubrication.

Silicones Not Recommended

The commercial silicon-treated cloths sold for cleaning film should *never* be used for this purpose. Not only is there an ever-present danger of scratching the emulsion by gritty particles adhering to the cloth, but an oily streak or mottle may be left on the film if too much silicone lubricant be applied, or the cloth be excessively dampened. Moreover, a smear of silicon oil on the film increases the pickup of dust from the air.

A number of laboratories which have used liquid silicone solutions for cleaning prints have reported trouble in the way of streakiness, smearing, and mottling. Experience with processed negatives cleaned with silicones indicates that materials of this type transferred to positive raw stock during contact printing produces photographic fog.

Even though the manufacturers of silicone cloths urge the use of their product for cleaning many articles found in projection rooms, we must strongly warn all readers against cleaning lenses with these cloths. A film of silicone oil on a projection lens results in a loss of focus and contrast and interferes with the optical functioning of the anti-reflection coatings. Also avoid cleaning shellac phonograph records with silicone-impregnated cloths. The silicones penetrate the shellac and cause physical deterioration of the delicate surface, thus accelerating record wear.

Rewinding Hints

Films ordinarily arrive at theatres wound on the shipping reels "head first." As previously explained, the film is inspected during the first rewinding, preferably on a hand-driven rewinder. This prevents the cinching and pleating which may occur when rapid motor-driven rewinders are stopped suddenly at frequent intervals by grasping the revolving reels.

The sudden arresting of a rapidly-turning reel allows the outer layers of a heavy roll of film on the driver element to keep on turning by sheer force of momentum. Since successive turns of oily film have a strong tendency to "lock", rather than slip, kinks and S-bends may be formed in the roll. Film which is pleated, or folded back upon itself, in the reel, usually tears and breaks in the projector. Any kinks present in a reel of film must be removed by winding it again at low speed.

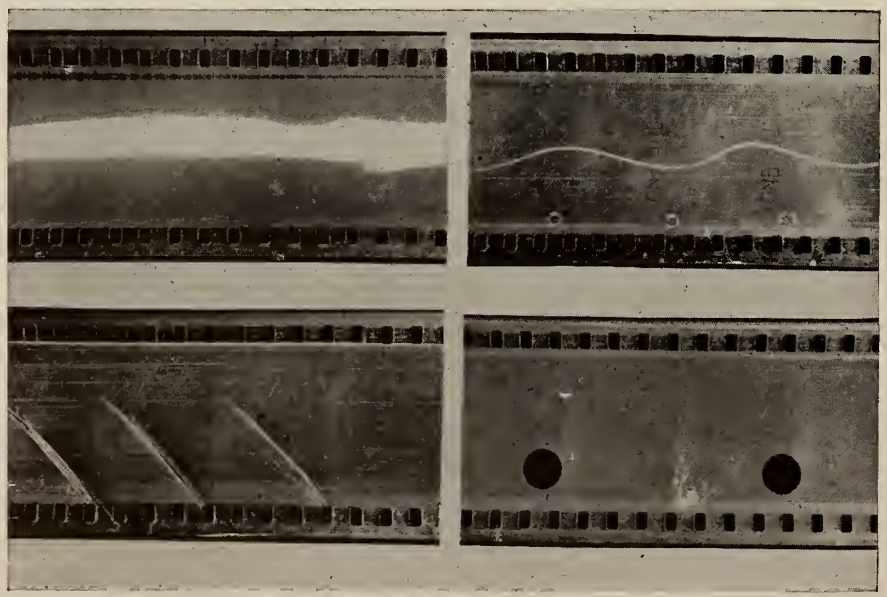
The film in the roll on the "dummy" element is severely strained by tightening, or cinching, when the revolving reels are suddenly arrested. The film may then become defaced by short lengthwise scratches—cinch marks.

The reel of film which has just been inspected and repaired is normally in "tail-first" order, and must be rewound for showing. The final rewinding may be done on the motor-driven rewinder.

Adjustment of Rewinder

This rewinder, which is also used for normal rewinding during the show, should be aligned and adjusted so that the film winds evenly, with a moderate

(Continued on page 28)



Four samples of unsightly changeover cue marks sometimes found at the end of reels. This type of damage is not nearly as common as it was some years ago, and is generally found on old prints that have seen a great deal of use in many theatres over a long period.

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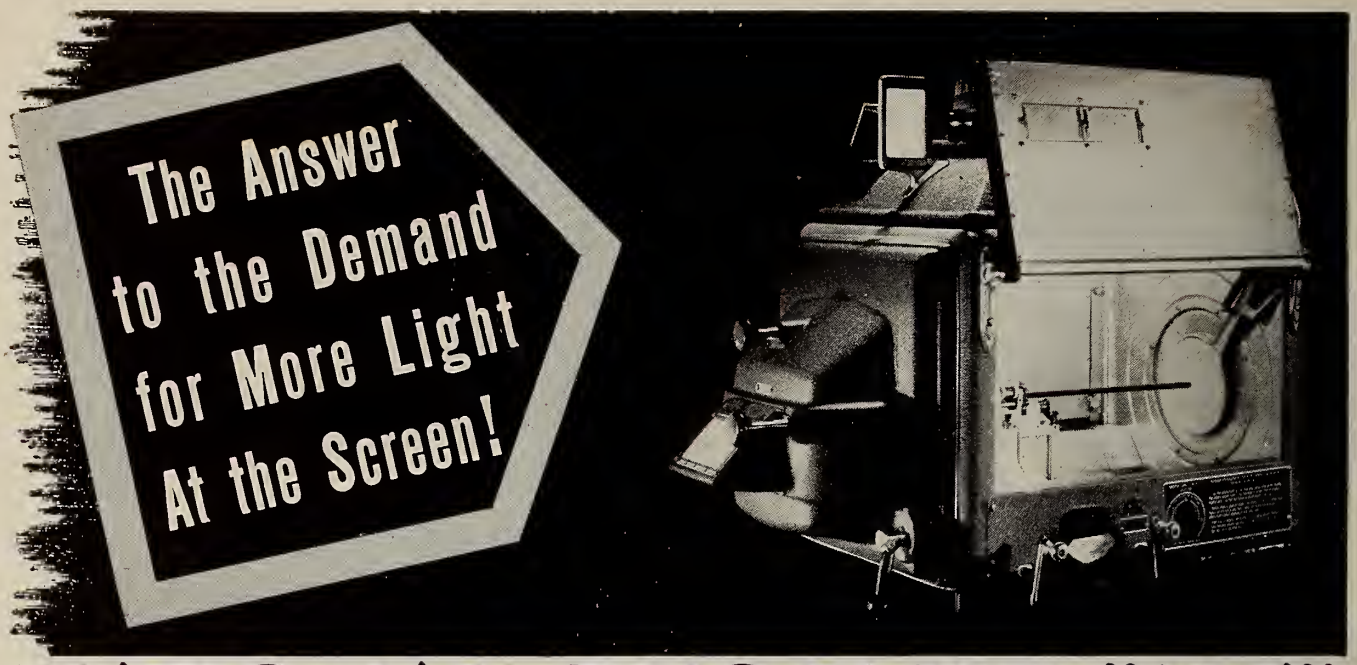
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A 'Push-Pull' Projector?

By J. G. JACKSON

Member, IA Local 348, Vancouver, B. C., Canada

IN standard (?) projection the rotating shutter cuts off and wastes approximately one-half the available light. holes, or two standard frames, at each In push-pull projection this waste light is utilized by directing it through a second aperture and to the screen.

Figure 1 is a side view showing the principle involved. Two standard film gates with apertures and lenses are arranged one above the other, and each has its own intermittent sprocket of 32 teeth. The film path is down through the top gate and intermittent sprocket and into a loop. From this loop it feeds down through the lower gate and its intermittent sprocket and into the second loop.

As the sprockets have 32 teeth, they each move the film a distance 8 sprocket pull-down. The intermittent cams are timed at 180 degrees and revolve at only 720 r.p.m., or one-half standard speed. Cams and stars are of standard Geneva design.

'Continuous' Projected Light

While the film in aperture 1 is being exposed to the light beam, the film in aperture 2 is on the move to the next frame, and *vice versa.* In this way a continuous light can be projected to the screen, first from one aperture and then from the next. The optical axis of the two systems meet at the screen center so that the two images will be superimposed but of opposite timing.

In front of aperture 1 is a stationary mirror, *A*, set at 45 degrees to the optical axis and facing *downward.* In front of aperture 2 is also a stationary mirror, *B*, at 45 degrees to the optical axis and facing *upward.*

Midway between mirrors *A* and *B* is a third stationery mirror, *C*, also at 45 degrees to the optical axis and facing upward toward mirror *A*. The mirror *D* is also at 45 degrees to the optical axis and faces downward. This mirror is in the form of a rotary shutter with a single blade of 180 degrees. This shutter rotates at a speed of 720 r.p.m. to coincide with that of the intermittent cams.

Mirrors *A*, *B*, and *C*, are water-cooled to absorb the intense heat of the light beam. Rotating mirror *C* is cooled by its own air currents as it revolves.

Assuming, now, that the film is stationary in aperture 1, the rotary mirror or shutter will be open and the light beam will fall into mirror *C* and will be reflected to mirror *A* and through aperture 1 to the screen. During this time the film in aperture 2 will move to its next frame. The rotary shutter will then cut the light beam and reflect the light to mirror *B* and through aperture 2 to the screen. While aperture 2 is being exposed, the film in aperture 1 will move and be ready for projection when the rotary shutter again opens the light beam.

Projection Sequence Bars Errors

Figure 2 shows graphically the projection cycle with a continuous flow of light to the screen. The cutover from frame to frame takes place during the period when both intermittents are on the "lock", thus there can be no travel-ghost.

Figure 3 shows the 180-degree balanced mirror shutter. Fig. 4 shows the approximate arrangement of images on the film where the frames are staggered to the distance between apertures. Thus, aperture 1 projects the frames with *even* numbers, while aperture 2 projects the frames with *odd* numbers.

This arrangement produces push-pull projection with continuous light on the screen and with an efficiency rating of 100%, except for the slight reflection losses in the mirrors.

This projector would be very well suited for television since the continuous light on the screen eliminates most of the scanning problems involved in converting from 24 to 30 frames per second.

For Cinerama or other very large screen projection, the double frame Vista-Vision principle can be used. The projector is then horizontal and the sprockets will have 64 teeth so as to pull the film two double frames, or 16 sprocket holes, at a time. This is considerable film to pull, but since the intermittent cams turn at only 720 r.p.m., the film velocity is no greater than in the present Vista-Vision projector.

By the use of anamorphic lenses a large picture suitable for Cinerama may be obtained from a single film. Almost any aspect ratio can be had from the double-frame aperture. With the high efficiency of this projector, ample light can be projected through the double-frame aperture to illuminate such a screen. This eliminates the troublesome joining of images that is now encountered in triple-projector Cinerama. With this type of projector there is no need for intermissions, as a normal two-projector setup can be used.

Single-Film 3-D Projection

With slight modification, this projector can be used to project 3-D pictures from a single film, even on a large screen. Single-frame projection is used, since the intermittent cams turn at standard speed of 1440 r.p.m. and will be timed at 90 degrees apart. The sprockets have 32 teeth to move the

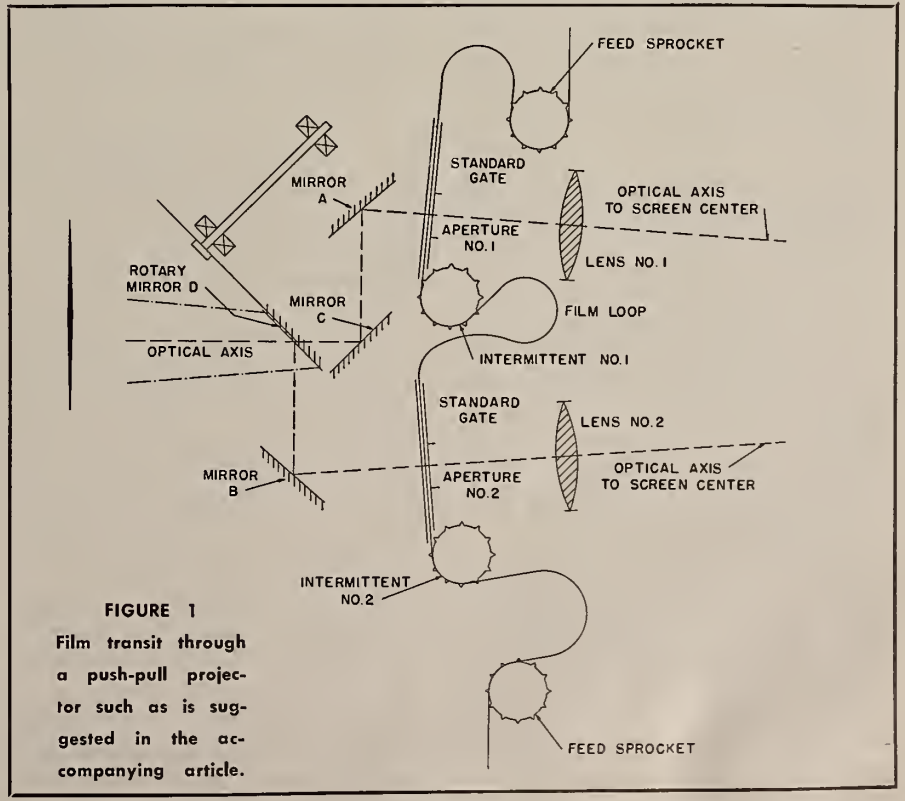


FIGURE 1
Film transit through a push-pull projector such as is suggested in the accompanying article.

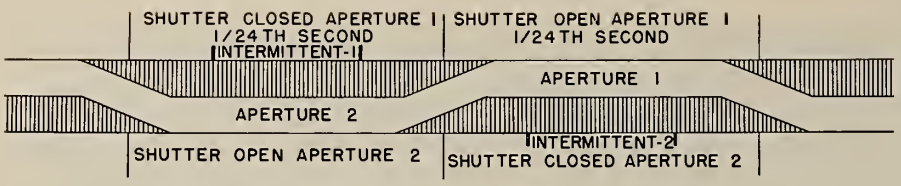


FIGURE 2

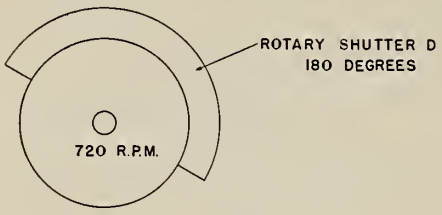
film two single frames at a time.

The rotating mirror shutter now turns at 2880 r.p.m. to give two exposures to each frame and 48 exposures per second to each aperture. One aperture exposes the right-eye images, while the other aperture exposes the left-eye images through the respective filters. Each image receives the same amount of light as is now obtained by the two-projector system.

Various Aspect Ratios Possible

Should the need arise for a screen with an aspect ratio of 3 or 4 to 1, it can be obtained by using the 3-D projector and anamorphic lenses. The optical axis of the two lenses would be seperated so that each lens covers only

FIGURE 3



one end of the screen, with the join of the two images in the centre of the screen. Thus the number 1 lens would cover the left half of the screen, while the lens number 2 would fill the right half of the screen. As each would project the standard 48 exposures per second, there would be no flicker problem.

EDITOR'S COMMENT: The concept of a push-pull projector for continuous projection is not a new one, but it has unfortunately been discarded by the trade for reasons of cost and mechanical and optical complications. The continuous projector devised by Dr. Emil Mechau of the Ernst Leitz Kinowerke, Rastatt, Germany, was probably the most successful from every point of view. When in good condition, the Mechau machine played standard 35-mm sound prints with remarkably life-like results on the screen.

It is interesting to note that a pair of Mechau projectors are being used at the present time by the BBC television studios in London. Some 30 years ago the Mechau had a brief tryout at the Capitol Theatre in New York City.

Jackson's push-pull projector differs from the Mechau in that intermittent movements are employed and is optically simpler, thus reducing likelihood of misadjustment and breakdown. The complicated rotary mirror system of the Mechau militated against wide use of this projector in theatres. The Jackson machine, however, has the almost fatal disadvantage of requiring SPECIAL PRINTS which would be useless for ordinary projection.

There is no doubt that the Jackson projector would work splendidly and give smoothly-moving and flicker-free pictures at approximately twice the illumination-efficiency of the standard type of projector. It would also serve admirably in the special applications mentioned. But the industry is not prepared to accept a projector which needs a radically off-standard type of print.

If one were permitted to induce further thought by Mr. Jackson on this intriguing subject, it would be to urge him to exercise his undoubted talents in the direction of a continuous projector for standard film release prints (whatever they may be these days), not so much in terms of image width as in continuity of image projection.

Projector Archivist

HERE is the second installment of data from the fabulous collection of projection memorablia amassed by Ray Brian (IA Local 434, Peoria, Illinois) in many, many years of dedicated research to the art and the craft he loves—motion picture projection. IP is indebted to Ray for making these data available, as should be the craft at large, many of whom have charted and are proceeding along a similar course.

Many of the projectors cited in the appended list are possessed physically by Ray, together with photos and detailed descriptions thereof. For many of the others, alas, Ray does not possess even a photo, and these are indicated in the following listing by an asterisk.

If there be anybody anywhere (and IP circulates world-wide) who can supply such data, he would be making a signal contribution to projection lore. Ray may be contacted through IP. Here is the second rundown:

BENBOW—mode in Austrolio before 1920.*

BESSUS—mode obout 1900.

BURWOOD—mode in Wilkes-Borre, Po., about 1924.

BING—mode in Germony, 1899 to 1914.

BIOGRAPH—Americon Mutoscope ond Biogroph Co., 1896: 70-mm, no perforations; loter 35-mm.*

BIOGRAPHET—Americon Mutoscope ond Biogroph Co., 1902.

BIOKAM—mode in Englond by Worwick Trading Co., 1898.

BIO-PICTURESCOPE—mode by W. C. Hughes, London, Englond, 1914.

BIOPTICON—Lathom's third mochine, 1896.*

BIOSCOPE—Built by Wolter Issac for Chorles Urbon, 1897.

BIOSKOP—Max Sklondowsky, Berlin, Germony, 1896.

BIRTAC—made by Birt Acres, London, Englond, 1898.*

BLAKE— . . . *

BRENKERT—Karl ond Wayne Brenkert, 1940; now R.C.A.

BREWSTERGRAPH—W. C. Hughes, London, Englond, 1912.

BROCKLISS—J. Fronk Brockliss, London, Englond, 1913.

CAMEOSCOPE—H. E. Roys, 1914.*

CAMERON—Jomes A. Comeron, Brooklyn, N. Y., 1910.*

CELLO—Hole Projector Co., Eost Boston, Moss., obout 1920.

CENTOGRAPH— . . . *

CENTRAL—made by Fuji Co., Jopon, 1954.

CENTURY—Century Projector Co., since 1923.

CENTREX—Austrolion version of the Century.*

CENTAURO—mode in South Americo, 1954.

CHARLIN—mode in France, 1949.

CHRONIK—August and Louis Chronik, New York, N. Y., 1899.

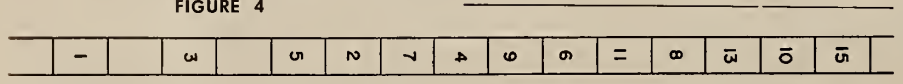
CHRONOGRAPH—Georges Deomeny, France, 1897.

CHRONOPHOTOGRAPHOSCOPE—obout 1900.*

CHRONOSCOPE—Honau and Gouthier, obout 1900.*

CIEROSCOPE—Appleton, obout 1900.*

FIGURE 4



Ampex Profits, Assets Up

Ampex Corp., Redwood City, Calif., completed its fiscal year April 30 in the strongest financial position in its history. Sales for the magnetic tape recorder manufacturer rose to $8,163,000 from the previous year's $5,418,000.

Profits for the past year showed a substantial increase and amounted to $762,621 before, and $365,736 after, taxes. These figures compare with $70,191 before taxes in the previous year, and $25,691 after taxes. Per share earnings after taxes for the year just ended climbed to 69 cents per share in contrast to six cents per share in 1954.

A Research Triumph: The Story of Black-and-White Film †

By C. E. KENNETH MEES

The second and final article of a series which details to the technically-minded, the thrilling story of the development of black-and-white film base.

NOW turn from the negative making material to the release-print positive, of which such very large amounts have always been used in the motion picture industry. The positive film has two characteristics in which it differs from the negative material. It must be of sufficiently fine grain to increase to the smallest possible degree the graininess inherent in the negative. It must also have a contrast which, when combined with that of the negative material, will give a satisfactory contrast in the projection print. The positive emulsion supplied as Eastman Cine Positive Film in 1916 met these requirements satisfactorily and remained unchanged for many years. When type numbers were introduced, it was assigned Type 1301.

Many attempts were made to produce a positive film having a lower graininess, but all failed because the film was too 'slow" for use on the standard printers and also tended to give a warm-toned image which was not generally satisfactory for projection. It was not until 1940 that Fine-Grain Release Positive Type 1302 was made having sufficient speed, provided that the printers were modified to increase the light available, and having definitely lower graininess than Type 1301 with an image of pleasing tone. Types 1301 and 1302, therefore, cover the whole history of motion-picture positive film up to date.

Colored Bases for Tints

About 1920 a demand arose for positive films on colored base, which enabled a tinted film to be obtained by simply printing upon film having the right color in the base. In 1921 positive films were available on lavender, red, green, blue, pink, light amber, yellow, orange and dark amber bases. When by 1929 sound films had displaced the silent films, difficulty arose with the tinted bases, because the dye absorbed the light used for exciting the photoelectric cells by which the sound record was reproduced.

A new range of tinted positive supports were therefore introduced under the name of Sonochrome. They were designed to provide satisfactory monochromatic scenes and, at the same time, enable the sound record to be utilized without difficulty in projection. After the fine-grain cinè positive was introduced in 1940, three of the Sonochrome tints were used for this new emulsion.

In 1926, J. G. Capstaff and M. W. Seymour published an important paper in the Transactions of the SMPE on the duplication of motion-picture negatives. At that time, prints made from duplicate negatives were notably inferior to direct prints. Duplicate negatives were usually made on Par Speed Negative material from projection positives and showed graininess, distorted tone scale and edge effects.

New Duplicating Film

A new duplicating film was made by the use of a fine-grained emulsion, the contrast of which was controlled by the addition of a water-soluble yellow dye. It gave little increase of graininess, good tone rendering and a minimum of edge effects, because development could be prolonged to eliminate the effects without producing too much contrast. At first, the same film, Type 1503, was used for both negative and positive.

In 1929 a duplicating positive, Type 1355, was introduced. Its speed was somewhat higher and its contrast somewhat lower than the standard release-print material of that date. In 1930 a fast, yellow-dyed negative material was coated as Type 1510. In 1933 a duplicating positive Type 1362 was introduced. In 1936 two new duplicating films were made having a finer grain than the regular positive of that date.

When the motion-picture trade adopted the reproduction of sound, interest arose in the use of special films for sound recording. There were two different methods of recording sound upon film: (1) that in which the density of the track was modulated, the variable-density method; and (2) that in which the width of the track was modified, the variable-width method.

In 1930 L. A. Jones and O. Sandvik published a discussion of the "Photographic Characteristics of Sound Recording Film" in the *Journal* of the SMPE. The variable-width recording method did not present a serious problem since release positive film gave very good results, but in 1928 a yellow-dyed, negative-type emulsion was introduced as Type 1507 for use in variable-density sound recording. Not until 1932, however, was a sound-recording film, Type 1359, supplied which gave results in variable-density sound recording sufficiently better than those obtained on motion-picture positive film for it to be generally adopted by the trade.

In 1936, Type 1357 was introduced for variable-area recording. Types 1357 and 1359 were very similar, and new films, Type 1372 for variable-area and Type 1373 for variable-density recording, were introduced at approximately the same time in 1944 and are still in use.

Films specially made for color photography are not dealt with here, but it should be mentioned that since 1916 many films have been made for use in current processes of color photography. The Technicolor Corp., for instance, has used special red-sensitive, green-sensitive and blue-sensitive negative films in its three-strip cameras. It has also used specially made matrix films and positive films on which the final image was built up by transfer printing. Many of these films have been made to the specifications of the Technicolor Corp., and their development is a part of the history of Technicolor.

Safety Base Films

Ever since 1909, efforts have been made to replace the highly inflammable cellulose nitrate base of motion picture films by a cellulose acetate

(Continued on page 27)

† Condensed from the "History of Professional Black-and-White Motion Picture Film," Journal of the SMPTE, Oct., 1954

Magnetic Recording, Reproduction

By L. D. GRIGNON

Development Engineer, 20th Century-Fox Film Corp., Hollywood

In line with its time-honored policy of providing space for anybody who has anything interesting to say about the process of motion picture projection, IP is privileged to present the appended article. Brickbats and bouquets will be our lot, we know; but this is the medium through which we reach the desired goal of technological exactitude.

IN your "Letters to the Editor," April 1955 issue (page 24) there appeared a reply to Mr. David Bliss concerning magnetic sound tracks. The first two paragraphs are precisely correct; but the paragraphs pertaining to magnetic recording and reproduction are seriously in error and should be corrected.

Sound for magnetic recording with CinemaScope is recorded and printed (actually a recording-transfer operation) with the high frequencies up to 8000 cycles per second faithfully reproduced and with slowly increasing attenuation of the frequencies above 8000 cycles per second. With optical sound systems, 8000 cycles per second must be suppressed by as much as 15 to 18 db in accordance with the Motion Picture Research Council recommendations.

The lack of surface noise is the result of magnetic recording methods, *not* frequency characteristic adjustments, and, as a matter of fact, it is possible to reproduce up to 8000 c.p.s. and higher with magnetic principally because of the lower noise from this medium and because of less distortion: the high notes are "cleaner" and less shrill and therefore not disturbing to the listener.

'Balanced' Reproduction Scale

There is another factor which contributes to the sound quality of CinemaScope magnetic tracks which is difficult to describe simply. The psychology of listening requires a balanced reproduction scale of frequency, by which is meant that if either end of the frequency range be extended, the other end must also be improved.

For example, if the treble (high) end is extended from 5000 to 8000 cycles per second, the bass (low) end must also be extended downward to 50 to 60 cycles per second—and both improvements must not add appreciable distortion. This is what is done in CinemaScope and is one reason for the better bass response. Similarly, any restriction of the frequency scale must be performed on *both* ends as with optical tracks.

It is the combination of magnetic recording, stereophonic methods, extended frequency range (both high and low ends) and lack of background noise which makes CinemaScope magnetic recordings superior to all previous motion picture sound methods.

You strongly criticize proponents of CinemaScope for being ". . . suspiciously aloof . . . from field evaluation" and ". . . for good reason, apparently". You will note on page 54 of the latest edition of the CinemaScope Handbook, "Information for the Theatres," a recommended theatre sound reproduction characteristic. If you will compare this with the standard Research Council Frequency Characteristic for optical sound, it will be again obvious that magnetic tracks reproduce much more faithfully than optical tracks.

Yes, But Can One Hear It?

Now, your last paragraph refers to little or no reproduction at 10,000 cycles per second. May I submit that if this were true, there would be no reproduction of any signals from the fourth track because the control signal, which must also be reproduced, is 12,000 cycles per second! The material in the Handbook, mostly obtained from theatre experience, shows that your criticism is unjustified.

We of Twentieth Century-Fox are intensely interested in field problems and have found the service companies cooperative and expending every effort to adjust theatres in accordance with recommendations by ourselves and the Research Council. We know this from frequent field trips.

If you have found theatres with poor speech intelligibility and no high-frequency response from magnetic (not optical-CinemaScope) it is most likely due to misadjustments, too little servicing, or too much "tinkering" in those theatres, because all five producers of CinemaScope in Hollywood using magnetic release tracks are doi. g a fine sound job.

EDITOR'S COMMENT: If practical considerations of sound reproduction in the average theatre be ignored, and only theoretical considerations and laboratory determinations taken into account, we could be in substantial agreement with the opinions expressed by Mr. Grignon. This point of view, however, would require us to forget the projectionist, who can do no more than attempt to produce a presentable picture and listenable sound from the print that is daily handed to him.

Differences of opinion anent C'Scope magnetic sound, in fact, have arisen *via* the inevitably inadequate procedures adopted by the average theatre and the average film exchange in regard to C'Scope magnetic sound. This type of sound is very different from standard optical sound, considered *as a process*, and it demands an entirely different point of view as regards the maintenance of equipment and the handling of prints.

On the basis of *regular* motion picture sound, C'Scope magnetic sound is incompatible in every sense of the word. Whoever thought of placing magnetic tracks on a *picture* film apparently knows little about the mechanics of *practical* projection.

Inherent Defects of System

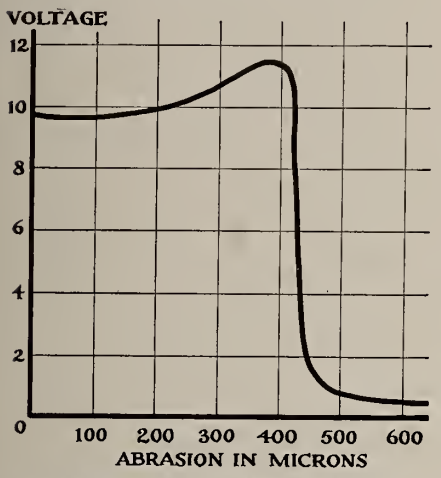
It is no secret that C'Scope magnetic tracks readily become attenuated through daily use in a wide variety of theatres, or that they pick up noise through the influence of stray magnetic fields or rapidly-moving steel and iron projector parts. It is no secret that the relative number of magnetic-track prints issued by 20th Century-Fox is far greater than the proportion of theatres fitted to play magnetic tracks of this type.

Furthermore, the 12,000-cycle control signal for the fourth track (used only by a small minority of theatres) hardly constitutes a serious indication of the high-frequency response appreciable by the ears of patrons

in the average house set up for C'Scope magnetic reproduction. Even the very fact that this particular frequency (12,000) was selected as a control is very revealing as to the high-frequency response expected of C'Scope magnetic reproduction.

Wide Cyclic Span

There is no apparent reason why 15,000 cycles should not be regarded as the practicable top-cut for C'Scope magnetic tracks *except for the accepted fact of magnetic-track deterioration in release prints.* With careful handling, and with the exclusive use of sound reproducers apart from picture projectors, different gap standards would permit reproduction up to and including 20,000 cycles with this type of track!



How reproduction of an 8,000-cycle track by a CinemaScope magnetic head decreases through wear. (A micron equals 39.37 millionths of an inch.) So rapid is the abrasion, that in much less than a year magnetic-track frequency response is inferior to that of regular optical-track sound. Sound quality deteriorates correspondingly, with "crumbly cough" distortion spoiling the sound.

There is no need to discuss attenuation at the highest frequencies if such frequencies come through to the ears of the listener, as every studio employs its own standards and exercises its own judgment in such a matter, limited only by the physical shortcomings of the system employed. This is why we find different standards applying to variable-area and to two separate systems of variable-density optical recording. With the advent of electro-optical crystal valves, a third set of standards will appear.

Formal Standards vs. Practice

We are not impressed with the attenuation standards advocated by *any* engineering body for the simple reason that no one pays any attention to them. (The standards mentioned by Mr. Grignon are applicable more to variable-density than to variable-area methods.)

We are acutely aware of the higher noise level of optical recording methods; but we are also aware of the stability of optical tracks and of the signal-to-noise ratio of optical recordings as a function of prevailing signal level, due to the characteristics of "noiseless" biasing of optical tracks. Magnetic recording is definitely superior to *all other types* of sound recording, but only so long as the records are handled with kid gloves, so to say.

There are other factors to be considered. Despite the introduction of new alloys for reproducing heads, which permit a C'Scope magnetic head to be used as long as a year without deterioration of sound quality, defects in the print tracks still remain. As far as the writer knows, Fox prints its magnetic tracks at high speed *via* passage of the master copy and the unmodulated print track through a high-frequency mag-

(Continued on page 26)

Do Our Ears Grow Old?

By H. C. MONTGOMERY

MEMBER OF THE TECHNICAL STAFF, BELL TELEPHONE LABORATORIES

Present day practitioners in the art of the recording and reproduction of sound waves talk and write glibly of frequencies of the order of 8-, 10-, and 12,000 cycles (while the pure idiots extend the range to 15,000). As a refresher for the informed, and as basic information for the unknowing, IP mischievously offers here excerpts from an article which it published 'way, 'way back in 1932. "Progress" will be the answer of the "moderns"—but this applies with double force to the life-span of a human and his constantly-diminishing aural acuity.

About 200 audiograms were available, mostly of Laboratories' employees ranging in age from 20 to 60 years. The subjects were selected in such a way that the proportion having defective hearing is about what might be found in any normal group of people. These audiograms were divided according to the age of the subject into four groups, each group including ten years.

The hearing of each age group was summarized by finding the median value of the hearing loss at each frequency. The median was used rather than the average because it is not so much affected by extreme cases.

2000 Cycles Vital Point

It is noteworthy that the difference between the thresholds of the youngest and oldest age groups is quite small compared with the difference between the normal and hard-of-hearing ears. In fact, at frequencies below 2,000 cycles the differences are negligible; but at frequencies above 2,000 cycles the differences become appreciable.

This decrease in average hearing ability with increasing age might be the result of either of two causes: a *considerable* impairment of the hearing of only a portion of the older group, or an impairment in the hearing of the *whole* group.

Reference to the original data indicates that the latter is the more nearly correct explanation, for the average deviation of the cases from the median is practically the same for all the age groups.

A question of practical interest is what effect the indicated change in hearing acuity will have on the ability to hear and understand in actual situations. The *upper* part of the frequency range, the only part sensibly affected, is of importance chiefly in distinguishing certain consonants and in appreciating the *timbre* or *quality* of musical sounds. In ordinary conversation, where speaker and listener are close to each other, no difficulty would be experienced by the 50-60 group, because the level of sound at the ear is high enough so that the falling-off at the high frequencies would not be noticed.

The theatre or lecture hall presents a different situation. Here the level of sound at the ear is often quite low. Moreover, the higher frequency components are usually relatively weak by the time they reach the ear, due to selective absorption . . . Under these circumstances, the 50-60 group might experience some difficulty in distinguishing consonant sounds, and mistake "thin" for "sin," "famish" for "vanish," and the like.

'Brilliance' Lacking

Music would probably sound somewhat different to members of the older group, but it is doubtful whether they would be aware of this difference because they would lack a standard of comparison. Melody and rhythm they would appreciate as well as anyone. But the tones would lack *brilliance*, and differences between the instruments would not seem so profund to them as to younger persons.

In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

ELSEWHERE in this issue is a compendium of questions and answers relative to Pay-As-You-See Tv, the plan of a few sponsors who *think* they have *invented* a process which will enable them to make billions of dollars through a scheme which will charge millions of people for an inherent civic right which the latter already possess.

The aforementioned compendium was prepared by, paid for and vigorously sponsored in many diverse ways by a group of motion picture theatre owners who promptly recognized the threat implicit in the Toll-Tv proposal. It will not be news to the readers of these columns that Organized Labor, and particularly the IATSE, have joined wholeheartedly in opposition to the plan.

The core of the arguments advanced by proponents of Toll-Tv is that they will give *something extra* beyond that which is now available through existing Tv facilities. Let it be said emphatically that this is the veriest nonsense: Toll-Tv proponents plan to give *nothing* but to *TAKE* for a restricted group of insiders! These guys tell everybody who hasn't sense enough to shut his ears that they will provide "*extras*" in the way of entertainment, educational and civic features, including warnings of an almost instantaneous attack by a foreign power, earthquakes, conflagrations in a given area, floods and every other conceivable catastrophe. The question is: "How?"

These guys also insinuate constantly that they will get "special" channel allocations so as not to interfere with the regularly scheduled Tv broadcasts now on the air for free.

Yea? Well, taking their word for it (which we don't) where are they going to get the transmitting facilities, no less than the receiving facilities for area distribution? What about transcontinental network transmission facilities? Shall we assume that they will accomplish this by osmosis?

These Toll-Tv people even had the temerity to announce last month that they had accomplished the feat of putting two signals on one channel—a story that hit the front pages of practically every major newspaper in this country and abroad (the dopes), while the ever-gullible trade press swallowed the potion without tasting it first. IP effectively debunked this silly nonsense in a terse statement of nine lines in its last (June) issue, p. 5. Nobody has yet challenged the statement, including its sponsor, Paramount Pictures.

Now, the sad part about this situation is that the general public, reading all this hooey, hasn't the vaguest notion of what is in the minds of these Toll-Tv guys. But it remains for a little guy like IP serving a small but select group of readers to tell the world, as follows:

These Toll-Tv sponsors plan to build *nothing*, either in the way of transmission, distribution or reception facilities. They plan to use *existing* transmitting facilities, *existing* distribution facilities, and *existing* reception facilities—the latter being YOUR Tv set. The only expenditure contemplated by these fellows, apart from an enormous publicity expenditure for the dissemination of "factual data" (?) among the unknowing general public and, especially, unknowing Congressmen, will be the decoding equipment, for which *you'll* pay, and punch-cards for YOUR Tv set. The word "existing" is not a mere notion with these fellows; it's a *disease* of planning and scheming.

There's not a single major motion picture producer who is not ardently in favor of Toll-Tv. Sure, he wants to sell existing motion picture theatres, existing Tv stations, and producers of commercial movies. Like any lawyer, he'll service any client—that is, any client with a ball pen.

Barney Balaban, president of Paramount Pictures, said a mouthful when replying to the published opinion of RCA Board Chairman David Sarnoff to the effect that Toll-Tv was unacceptable. Said Balaban: " . . . pay television is inevitable," and he added a reaffirmation of "his faith in the coin-box Telemeter system as being the most practical for Pay-As-You-See television."

Nice going even for Balaban, whose company has made billions out of motion picture theatres for many years in the form of film rentals. His right to an opinion in the matter is indisputable —but his crack about Sarnoff's "pious declarations" should have been accompanied by a frank statement that Paramount Pictures *owns* Telemeter. Also, that Paramount Pictures have been charging motion picture theatres *within the past year* playing-time percentages of up to 70% of the net income, the latter being determined *by Paramount!*

It is expected that the Toll-Tv hot potato will be passed on by the Federal Communications Commission to the Congress of the U. S. A., where one



Pictured here are the guests af hanar at the recent 40th anniversary celebratian af Lacal 626, Nashville, Tenn. Left ta right: E. B. Hester, vice-president, Tennessee Federatian af Labar; W. H. Parham, State Cammissianer af Labar and member af Lacal 626; IA President Richard F. Walsh; W. J. Brawn, taastmaster and secretary of the Local; Charles Hauk, secretary-treasurer, Tennessee Federatian af Labar; Han. Ben West, Mayar af Nashville; A. S. Jahnstane, IA sixth vice-president and member of New Orleans Lacal 293; R. M. Martin, treasurer af Lacal 626; and Maynard Baird special IA representative and member af Lacal 405, Knaxville, Tenn. Amang the invited guests were representatives af mare than 25 IA Lacals.

The IA Executive Board will hold its regular mid-summer meeting at the Bismark Hotel in Chicago the week beginning August 8.

may be sure that every member will have his back-home antenna adjusted to its maximum height. Millions of words will be spilled, but assuredly the truth about the use of *existing* facilities will finally emerge. With the traditionally labor-conscious Democrats in control of Congress, it will be *something* to see them go along with *not* quarter-in-a-slot but dollar-in-a-slot Toll-Tv—*plus* installation and equipment costs to the average homeowner.

We haven't yet mentioned the installation, servicing and money-collection worries of the Toll-Tv boys. That's *their* headache, as yet unrelieved.

You know, Toll-Tv might possibly prove a boon to all entertainment enterprises. In the small- and medium-sized towns and cities having only one channel, the subscriber might not like the Toll-Tv show in a given 8-to-10 p.m. slot. This might drive him out of the house to a tavern, to the ballpark, or even to the movie theatre. So be it.

Every wage-earner, affiliated with a national organization or not, should battle Toll-Tv to the point of its extinction.

● Technicians and engineers employed at stations WOR and WOR-TV, New York City, last month chose the IATSE as their bargaining agent. In an election conducted by the National Labor Relations Board, 98 votes were cast in favor of the IA, and 10 for the IBEW (International Brotherhood of Electrical Workers) former bargaining agent for these employes.

At present, representation of engineers and video cameramen at the six Tv stations in New York City is equally divided among three competing unions —those at DuMont's WABD and WOR-TV are covered by the IATSE; WPIX and WCBS-TV by the IBEW; and WRCA-TV and WABC-TV by NABET (National Association of Broadcast Employes and Technicians).

In another election held early this month, graphic artists employed by the CBS studios in New York City voted unanimously for IA representation. They will be affiliated with the IA's Radio and Television department, which already covers a number of other CBS groups. In addition, CBS carpenters, electricians, propertymen, makeup artists, wardrobe attendants, and film cameramen are represented by New York City IA Locals.

● Gold life-membership cards in Detroit Local 199 were awarded to 10 of its charter members at a recent midnight banquet. IA President Walsh was the principal speaker at the affair and he also made the gold-card presentations on behalf of the Local. The honored members are Lloyd Burrows, Henry F. Falk, Edward Foster, William Jose, Bud Kirby, Sherman J. Lambly, John Mac Donald, Earl J. McGlinnen, Cass Newell, and James Powers, Sr.

● Under the terms of a three-year contract recently concluded between Local 241, Vallejo, Calif. and theatre exhibitors in Contra Costa, Solano, and Napa Counties, the members of the Local will receive a 10c-per-hour wage increase for the first two years, retroactive to February, 1954, when contract negotiations began, and an additional 5c per hour for the third year.

The pact also provides for two weeks' paid vacation for each year of employment. Swing-men and part-time employes will be eligible for vacation pay based on a pro rata of 40 hours per week. An important part of the vacation clause in the contract is as follows:

"Projectionists who permanently sever their regular employment with a company or theatre at any time after one month of regular employment shall be compensated for that portion of vacation time earned on the basis of one-sixth of their basic weekly salary for each full month's employment."

The 5c-per-hour paid by the employers to the Local's Health and Welfare Fund has been extended to include paid vacation shifts. Daniel W. Akin, business representative, was in charge of negotiations for the Local.

● By an overwhelming majority of 170 to 8, the Screen Publicists Guild, representing "drumbeaters" in the movies, Tv, and radio voted in favor of affiliation with the IA. The decision highlighted three months of study and investigation into possible affiliation with other organizations. The Guild was formerly associated with the Painters International.

● District No. 10, comprised of IA Locals in the state of New York, held its annual convention at the Statler Hotel in Buffalo on July 17. The annual convention of the State Federation of Labor opened there the day following.

OBITUARIES

Adam Louis Tennis, 65, member of Local 337, Utica, N. Y., died suddenly on June 17. A resident of Utica for the past 50 years, he worked in the projection room of the Avon Theatre there since it opened about 30 years ago. Besides his wife, he is survived by his mother, one daughter, one sister, and two brothers.

Carl Beals, 43, member of Detroit Local 199, died last month. At the time of his death he was a projectionist at the Colonial Theatre. He is survived by his wife and three children.

Ernest R. Terrill, 80, member of Local 337, Utica, N. Y., died last month after a long illness. Prior to his last illness he worked in many of the theatres in the Utica area. He was a member of Shenandoah Lodge 95, Odd Fellows; Oriental Lodge 224, F & AM;. Utica Post 229, American Legion Band; Tigris Temple in Syracuse, and Mohawk Valley Consistory. Survivors are his wife, two sons, eight grandchildren, and a great grandchild.

Joseph S. Griggs, 54, member of Local 386, Columbus, Ohio, died of a heart attack on June 12. He was stricken while doing relief work in the projection room of the Uptown Theatre there. He was regularly employed at the Garden Theatre in Columbus. He is survived by his wife, daughter and step-daughter.

William J. Jarvis, 65, member of Local 285, Troy, N. Y., died last month after a lingering illness. At the time of his death he was chief projectionist at the Troy Theatre there. He was one of the old-line members of Local 285, and many years ago he traveled with the D. W. Griffith feature "Hearts of the World."

Thomas A. DeSchantz, member of Pittsburgh Local 171 and projectionist for many years at the Regent Theatre in East Liberty (Penna.), died recently at the Columbia Hospital.

IA ELECTION

LOCAL 628, CHARLEROI, PENNA.

James A. Woods, *pres.*; Carl Hanel, *vice-pres.*; Joe Petrosky, *treas.*; Tip Hodgson, *fin.-sec.*; Kirk McLain, *cor.-sec.*; R. J. Crosby, *bus. rep.*; Armand Lorenzi, *sgt.-at-arms;* E. A. Leinhach, Anthony Lorenzi, and Victor McCrory, *trustees.*



Congratulations are in order from H. M. Bessey (right) executive vice-president of Altec Service Corp., as Marty Wolf assumed post of sales manager on July 1.

LETTERS TO THE EDITOR

Lens Calculation Formulae

To the Editor of IP:

Please give me the proper formulae for calculating the following:

1. Size of Lens
2. Throw
3. Size of Screen

H. ABBOTT

Victoria, B. C., Canada

EDITOR'S COMMENT: Here are the standard formulae for computing (1) equivalent focus of projection lens, (2) "projection distance," or throw, and (3) size of picture on screen. It must be understood at the outset that all dimensions should be in the *same* units of measurement. In American and British practice *inches* are used because the dimensions of projector apertures are usually stated in fractions of an inch. It is absolutely necessary, therefore, to convert the throw and screen-picture dimensions into inches when using these formulae. (Multiply all distances and dimensions which are given *in feet* by 12.)

A. FOR STANDARD (NON-ANAMORPHIC) PICTURES

1—Focal Length of Lens:

$$\text{Lens Focus} = \frac{\text{Throw x Aperture Width}}{\text{Picture Width on Screen}}$$

2—Throw:

$$\text{Throw} = \frac{\text{Lens Focus x Picture Width on Screen}}{\text{Aperture Width}}$$

3—Size of Screen: *(a)* Height:

$$\text{Picture Height on Screen} = \frac{\text{Throw x Aperture Height}}{\text{Lens Focus}}$$

(b) Width:

$$\text{Picture Width on Screen} = \frac{\text{Throw x Aperture Width}}{\text{Lens Focus}}$$

B. FOR CINEMASCOPE (EXPANDED-IN-WIDTH) PICTURES

1—Focal Length of Lens:

$$\text{Lens Focus} = \frac{\text{Throw x Aperture Width x 2}}{\text{Picture Width on Screen}}$$

2—Throw:

$$\text{Throw} = \frac{\text{Lens Focus x Picture Width on Screen}}{\text{Aperture Width x 2}}$$

3—Size of Screen: *(a) Height:*

$$\text{Picture Height on Screen} = \frac{\text{Throw x Aperture Height}}{\text{Lens Focus}}$$

(b) Width:

$$\text{Picture Width on Screen} = \frac{\text{Throw x Aperture Width x 2}}{\text{Lens Focus}}$$

The first four of these eight formulae should be memorized. The last four—the formulae for anamorphic pictures—are obtained from the first four merely by multiplying aperture-width by 2, the "expansion-factor" of the CinemaScope anamorphic lens. Aperture-height, it will be noticed, is not affected by the anamorphic attachment.

Projectionists who are handy with algebraic transformations need only memorize the following "master equation" in which D is the picture dimension (height or width) on the screen, f is the E.F. of the lens, d is the aperture height or width, E is the anamorphic expansion factor (1 for non-anamorphic standard projection, 2 for CinemaScope), and T is the throw.

$$Df = TdE$$

From the foregoing equation are derived:

$$f = \frac{TdE}{D}, \quad T = \frac{fD}{dE}, \quad \text{and} \quad D = \frac{Tde}{f}$$

In regard to aperture dimensions, it may be helpful to keep in mind that all normal non-anamorphic apertures are 0.825 of an inch in width. CinemaScope aperture-widths, on the other hand, are 0.839 inch for optical sound, 0.910 inch for magnetic, and 0.715 inch for the undersized 2/1 aspect ratio.

Aperture heights vary greatly, depending on aspect ratio. All three of the CinemaScope apertures mentioned above, however, are uniformly 0.715 inch high. The standard non-anamorphic aperture (aspect ratio 1.375/1) is 0.600 inch high. Widescreen apertures have the following heights:

1.66/1	aspect	ratio,	0.497 inch
1.75/1	"	"	0.471 "
1.85/1	"	"	0.446 "
2/1	"	"	0.412 "

These aperture width and height data must be used in the formulae previously given.

Magnetic Repro Advances

To the Editor of IP:

Extraordinary lengths have been gone to in the design of heads now being manufactured by Ampex, and by other magnetic equipment producers, to assure that the material will in no way damage the sound tracks or the film to which they are attached.

Any research on new materials must turn up a material which has the same degree of safety in operation as materials now in use, which make the problem severe indeed. Not only must the heads themselves be designed so as to produce no damage to the film, but the magnetic reproducer mechanical system must be carefully manufactured so that no part can scratch the film as it passes through the mechanism. Much emphasis has also gone into this aspect of the design of these machines.

4 Million Film Feet Wear Now

As for the wear characteristics of materials currently used in Ampex reproducing heads, these are guaranteed for more than four million feet of operation at the present time! Extensive analysis of Ampex heads in use in theatres makes it appear that substantially more than this is being obtained from the largest proportion.

This is not to say, of course, that further extensions in life are unnecessary or undesirable, but that such extensions, if made, must *not* be made at the expense of other desirable operating characteristics.

There are several reliable materials which hold promise of good electrical and film safety characteristics, all of which are under intensive investigation here. We are not, at this time, however, in a position to advise you of definitive results. Each material has disadvantages, and only rather extensive research will establish which among them offers the best compromise of desirable characteristics.

P. L. GUNDY

Manager, Audio Division
Ampex Corp., Redwood City, California

Giant Eastern Tv-Film Lab

Plans to build what is described as "the largest Tv film processing laboratory in the world" in New York were announced this month by Consolidated Film Labs. Located on West 57th Street between 10th and 11th Avenues, the plant is expected to open September next.

While developing and printing of theatrical films will not be entirely excluded, the facilities of the new lab will be devoted primarily to the needs of Eastern Tv producers.

'Cinemaplastic' White Screen Coating

By LEONARD SATZ
Raytone Screen Corporation

CINEMAPLASTIC is a white screen paint with a high-vinyl solids content. After the last World War, the Armed Forces made great use of a similar product for "moth-balling" the Fleet and, also, many types of large bombing planes. The resistance of this material to the elements prompted the development of this product for drive-in theatres. It is completely waterproof and weatherproof, and has extremely high adhesion to all types of screen surfaces.

The ideal situation would be the application of Cinemaplastic on the unfinished screen surfacing; however, if a previously painted surface is in good condition without evidence of blistering, peeling or flaking, Cinemaplastic will adhere to the old surface with great strength and form a plastic bond that will protect the old coating and the screen tower from the weather.

Being a true vinyl plastic material, when applied it becomes a tough flexible skin that will expand and contract with extremes of heat and cold. It is completely washable and can even be steam-heated. Furthermore, since it has such a high solids content and actually forms a "skin," it is the best plastic devised so far for filling joints and seams on the average screen tower. Caulking or filling of seams is not required.

Spray Application Method

Cinemaplastic is applied with a spray technique, and because of its heavy body, the coverage does not exceed 100 square feet of surface for each 1½ gallons of the material. Specific instructions are furnished for application, and a large commercial spray outfit with a rating of at least 60 cubic feet of air per minute is required for good results. A paint pot with agitator, an oil and water extractor and pressure regulators, are required for perfect results.

Since the material has a slight egg-shell gloss, the technique of application should impart an "orange peel," or stippled surface, for perfect diffusion.

This material was subjected to extremely rigid tests in a fadeometer for fastness to light, which determines the degree of "yellowing", which was rated negligible. These same samples were further tested for resistance to accelerated weathering, using Federal Specification test methods that employ an arclamp source with 180-minute cycles of water spray. Upon completion of exposure, the test panels exhibited a negligible amount of water-spotting. No other degradation was evident.

Tests Tend to Prove Longevity

Summing this up, it can be reported that the tests were eminently satisfactory, and quite unusual for a product of this kind. Since this is a white screen surfacing agent, the brightness gain and distribution of a white theatre screen can be expected. It is not a high-gain or specular surface such as that produced by metallic aluminum paints.

A few hundred installations have been completed with this process, and Cinemaplastic screens now two years old are still in a wholly usable condition. With careful evaluation, it is the opinion of the manufacturer that this product should last outdoors for 7 to 8 years before requiring resurfacing. It may well last longer.

PERSONAL NOTES

RALPH B. AUSTRIAN has been appointed West Coast manager for Allen B. Du Mont Laboratories. Supervising all DuMont activities, he will make his offices in Los Angeles and will be in charge of sales as well as government contract, research and development work. He was recently senior assistant with Charles Luckman in the firm of Pereira & Luckman.

L. DOUGLAS NETTER, JR., formerly with Altec Service Corp., has been appointed vice-president of the Todd-AO equipment division. Netter inaugurated the Altec sales drive and headed the sales promotion drive which marked the activities of Altec in behalf of several thousand CinemaScope and stereophonic sound installations. Prior to his Altec assignment he was sales manager for the non-theatrical films sales department of Pathe Industries.

ALEXANDER F. VICTOR, founder of Victor Animatograph Corp., Davenport, Iowa, was recently honored by the Department of Audio-Visual Instruction, National Education Association. The NEA cited his contributions to the use of the motion picture in education and lauded his efforts in the establishment of a safety standard for non-theatrical film with a commendatory scroll. It also acknowledged and credited Victor with the first safety standard projector (28 mm), the first 16-mm motion picture camera and projector, and the optical sound reduction printer.

JAY H. QUINN has resigned as manager of sales and advertising of the Fairchild Recording Equipment Co. He plans to establish a sales company in the N. Y. City territory catering to radio studios, broadcast stations, recording studios, etc., with professional quality items.

GRANT U. MYERS has been appointed vice-president and comptroller of the Radiant Manufacturing Corp., Chicago, producers of projection screens. Formerly manager of plant accounting at the Wisconsin Steel Works of International Harvester Co., Myers is a member of the executive program of the University of Chicago.

More on Cleaning Lenses

To the Editor of IP:

I read "Oops; Says IP on Lens-Cleaning Data" in the May issue of IP (p. 28), and was happy to note IP's views on the subject. For many years we have advised the industry to use a lens cleaner void of soapy ingredients. Our lens tissue is made to government specifications and used by all of the Armed Forces and optical industrial establishments. Finely textured, it doesn't scratch the finest clear or coated lenses. The lens tissue book is sized 4 x 6 inches and contains 100 perforated sheets which may be extracted without tearing.

A. LEE
Rosco Labs, Brooklyn, N. Y.

Why High-Speed Optics?

The larger picture area requires additional light. This being so, an F:1.7 or F:1.8 lens, as compared with lenses of slower speed, is a distinct advantage, because it delivers to the screen an eye-filling 20% increase in light.

It is understood, of course, that unless the entire optical train from reflector or condenser set-up be in proper alignment, the advantages accruing from any fine optics will be dissipated. "High speed," optically speaking, is of no value whatsoever unless the other elements in the projection train (particularly the working-distance from either the reflector or the condenser combination) are in proper order.

Unless the entire optical train be in proper alignment, the best lens in the world will deliver unsatisfactory projection screen results.

This Business of Toll-Tv

ONE of the most pressing social and economic problems confronting the motion picture industry today—in terms of *exhibition*, that is, theatres—is that of pay-as-you-see Toll-Tv. To date, IP has refrained from any active editorial participation in this arena for the simple reason that it never believed that the sponsors of Toll-Tv would get away with that which they now contemplate.

But IP's thinking in this direction was abruptly short-circuited when it became apparent (by the route of certain private information) that the sponsors of Toll-Tv had in mind *not* an *extension* of present facilities (the movie theatre, aural radio and Tv stations) but a take-over thereof. We refer our readers to the comment appearing in the "In The Spotlight" department of this issue.

Here is a compendium of questions and answers which, while frankly the product of an outfit which favors our point of view (Organization for Free Tv) is nevertheless a group which furthers the cause in which IP believes:

QUESTION: *What is Pay-To-See television?*

ANSWER: It is a scheme to make *you* pay for Tv programs.

QUESTION: *How does it work?*

ANSWER: Fundamentally, it is an electronic method of "scrambling" the reception on your Tv picture and sound so as to make it absolutely worthless. The second step is to "unscramble" picture and sound, for a price, to be collected from every Tv set-owner who wants to see the program. All proposed systems operate on this basic pattern.

QUESTION: *Why do I hear this invention described as a "modern miracle?"*

ANSWER: For no reason except, perhaps, that it would be a miracle if the American public tolerates such an outright and unwarranted invasion of its rights. Today's Tv picture-and-sound transmission really is a miracle. Pay-To-See Tv does nothing but Distort this picture and sound.

QUESTION: *Does Pay-To-See Tv represent "progress," as its proponents claim?*

ANSWER: No, because in no sense whatever is it creative, as were the automobile, the airplane, and broadcast facilities. In addition, taking something that the public is getting *free* and making them pay for it, for personal profit to a few patent-holders, is selfish and un-American.

CLAIM: *As a part-time, new service, Pay-To-See-Tv would add to regular television by delivering "premiums" in entertainment from stage, screen, concert hall and stadium, as well as whole chapters of knowledge usually confined to textbooks, classrooms, or laboratory presentation.*

THE FACTS: In any given year, there aren't more than a dozen "extraordinary" shows—and those are the ones meant by "premiums." That raises this problem: what happens when they run out of "premium" shows?

Their claim that they are going to bring you whole chapters of knowledge usually confined to textbook, classroom, or laboratory is misleading. Right at this moment, there are scores of outstanding programs of this nature being telecast free over networks and local stations all over the U. S.

CLAIM: *Pay-To-See Tv, described as a supplement of free programming, would enter the present structure of the entertainment business as a healthy competitor.*

THE FACTS: It is not a supplement but a substitute for Free-Tv shows. Being in no respect whatever a creative aim, Pay-To-See is a competitor for profit, and nothing else. What we have here is an astonishingly frank announcement that the Pay-To-See group intends to buck the Free-Tv structure and, by every means at its disposal, seek to destroy it.

CLAIM: *Pay-To-See Tv does not replace Tv programs.*

THE FACTS: How can two programs come over one channel? If you don't pay, there is *nothing else to see.*

CLAIM: *The programs which Pay-To-See Tv could bring viewers are "cultural commodities" now paid for outside the home in theatres, movie houses, stadiums, arenas and other public places.*

THE FACTS: Free-Tv offers a dozen "cultural commodities," at least, in any week of the year. It is pure nonsense to pretend that Pay-To-See Tv can provide more or better cultural programs than Free-Tv. This certainly holds true, too, in any branch of science, music or the arts, all of which have been generously presented on Free-Tv. The best recent example is the outstanding coverage provided by Tv and radio to the story of the Salk polio vaccine research and results.

CLAIM: *Pay-To-See Tv, in bringing fine films and plays to millions in the home, would still not "do away with the theatre." Two box-offices mean more and better "theatre" for all.*

THE FACTS: This claim is ridiculous. A producer who telecasts a movie or a play directly into the home clearly and distinctly by-passes the theatre, making it obsolete and unpatronized.

CLAIM: *Pay-To-See Tv would help movie producers, sports promoters, and legitimate theatre owners by giving them a gigantic outlet for their new products.*

THE FACTS: The "gigantic outlet" referred to, it must be emphasized, was created by Free-Tv. Now that it has been established a handful of men are trying desperately to take it over. These men are fully aware of the appeal to producers and promoters—no real estate taxes, no unemployment taxes, no social security benefits, no pay-roll to meet. And, clearly, the producers and promoters will not have to meet these obligations if they abandon their theatres, playhouses, and arenas. But just as clearly, thousands of wage earners will lose their jobs. Thus, the handful of men will profit tremendously while the country as a whole suffers seriously.

CLAIM: *With Pay-To-See Tv you could experience the thrill of an opening night on Broadway for a fraction of box-office prices.*

THE FACTS: A top NBC engineer states flatly that that claim is an absurdity. (1) No Broadway theatre is physically equipped to bring a play to the television audience; (2) once a Broadway theatre is equipped to transmit a play via television it is no longer a theatre and thus cannot accommodate an opening night audience; (3) to convert a Broadway theatre so that it can telecast a play, the *very first step* is to rip out the first 25 to 30 rows of seats . . . exactly the seats used by the persons who make the first night what it is.

CLAIM: *Pay-To-See Tv would make available anything the public wanted to see at a fraction of the cost of attending.*

THE FACTS: A recent telecast of "Peter Pan" was watched without charge by about 60 million people. Pay-To-See Tv proponents admittedly would have charged its subscribers 50 cents per set to watch it, in addition

to which the subscribers would have had to pay for a gadget costing between (at present figures) 75 and 100 dollars.

Consider the set-owner. He must purchase the unique and exclusive gadget put out by the company which is bringing him the play, film or sports event. Now, with three companies bidding for "premium" shows, the set-owner, if he wants to see all these shows, may have to purchase three separate gadgets to keep up with the Pay-To-See Tv. The entire notion of being compelled to purchase these gadgets is ludicrous.

CLAIM: *Pay-To-See Tv operates on credit, billing the viewer on the basis of holes punched in cards by the decoder, or on a cash basis.*

THE FACTS: Do you want a collector in your home? The decoder, by itself, is not enough. In addition, the set-owner must purchase a "cash-register" which is attached to his set. This operates along with a card he has bought, to unscramble the picture.

Practically everyone is aware of what a sensitive instrument is a television set. The un-scrambling process may well lead to trouble with the set—the sort of trouble that means loss of the "picture." On any Pay-To-See Tv basis, the set owner will have no way yet described to get his money back if unscrambling results in "picture" failure.

CLAIM: *Pay-To-See Tv is a system whereby the program viewer can make direct payment to high-quality programs.*

THE FACTS: To obtain high-quality Tv programs, there is only one place the "slot-machine network" can turn to for talent—that place is Free-Tv. High quality, moreover, is a master of taste, and thus is impossible to guarantee. The only certain thing here is that the set-owner will not get his money back if the Pay-To-See Tv program doesn't please him.

CLAIM: *Zenith Radio Corp.'s Phonevision laboratory has produced the devices necessary to make subscription television successful.*

THE FACTS: Subscriber-Vision (Skiatron, Inc.) and Telemeter (Paramount Pictures) also in the business of furnishing Pay-To-See Tv gadgets, *just happen* to have equipment which the set-owner may have to buy. Which will you buy? Do you know?

Here an unfortunate and expensive dilemma suggests itself: A set-owner who is unaware of this competition may buy a gadget that can bring him only the programs owned by the company which produced the gadget. All others are blacked out.

CLAIM: *Pay-To-See Tv equipment will not interfere with the use of a broad-*

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casting station's transmitter for regular commercial traffic.

THE FACTS: *The above is just not true.* It is impossible to transmit both Paid-For shows and Free shows at the same time. The set-owner who does not purchase Pay-To-See equipment cannot receive anything from that station until the Paid-For show is over.

CLAIM: *Pay-To-See Tv will be operated as a new, part-time service by UHF Tv stations only.*

THE FACTS: In the beginning, maybe, but only an incredibly naive person would believe it would continue that way. Once established, the Pay-To-See group will capture all the talent and all the networks Free-Tv uses today and sell it back at a high price to the set-owner. There is always the threat that television then will become a closed corporation—open only to Pay-To-See Tv subscribers at a price.

CLAIM: *Pay-To-See Tv will not affect today's pattern of sponsored television but will introduce new programs.*

THE FACTS: Again, this just is not true. Proponents openly declare they will charge money for the World Series, championship fights and other sports events now fully covered on Free-Tv.

But they do not stop at sports programs. Here are excerpts from a letter written by the Public Relations Director of Zenith Radio Corp. on March 25, 1955, to every television station operator in the United States.

"On March 7, 65 million people watched "Peter Pan" and the reaction from every segment of the industry and the public was overwhelmingly favorable. According to figures quoted to us, it cost something more than $600,000 to put "Peter Pan" on the air. It is *exactly the kind of entertainment* which subscription television could bring to the home viewer, and to your station as a *regular weekly event.* While the sum of $600,000 for a single program is staggering to a sponsor, it represents *less than 1 cent per viewer* for the "Peter Pan" audience. On subscription television and With The Same Audience Paying Only 25 cents per set to watch the attraction at home, the box-office would have amounted to $5,000,000 for division among producers, distributors, and broadcasters."

Does this sound as though the "slot-machine boys" will keep their hands off today's Free-Tv? Of course not, and they know it, even though they continually mouth insincere promises that they have no designs on today's top programs!

CLAIM: *Pay-To-See Tv will be received on Tv sets now owned by the public.*

THE FACTS: The attempt in the above claim is to avoid stating the hard fact that a set-owner must buy a gadget and a code-card or slot-machine device before he can watch any Pay-To-See Tv program . . . both of which are attached to his present set.

CLAIM: *The actual cost per Pay-To-See Tv program to viewers would undoubtedly vary, depending upon the nature and length of the "premium event" that is being televised, but would be only a fraction of the box-office prices.*

THE FACTS: The only cost at present to a set-owner is the cost of his Tv set. Under the Pay-To-See Tv plan, the cost of the gadget will be added, the cost of the decoder will be added, installation charges will be added, and, finally, the cost of each program will be added. Thus, the cost of seeing these so-called "premium shows" may well run, in a year's time, to from $375 to $1,125 per family, over and above initial costs for necessary equipment and installation.

This added expense is entirely without justification in view of constantly improving Free-Tv programs.

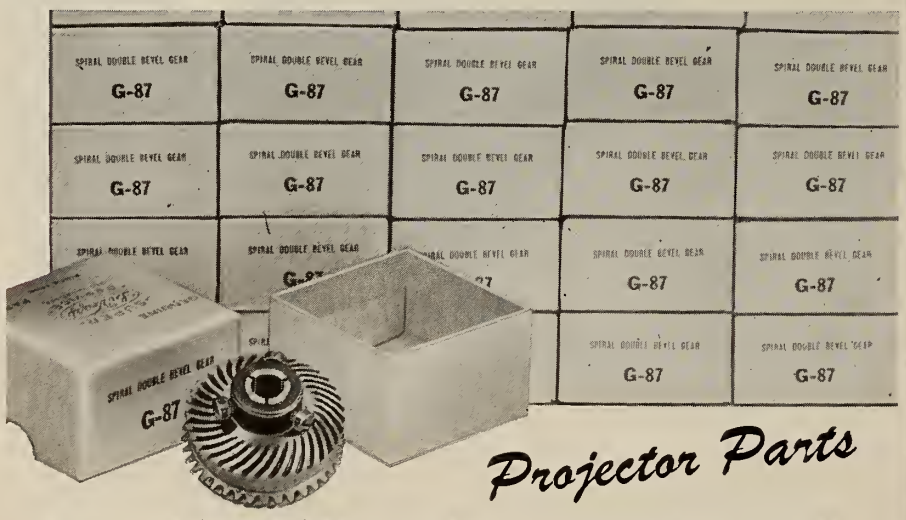
CLAIM: *With Pay-To-See Tv as an added service available to broadcasters, television stations would have revenue from both Pay-To-See Tv and advertising sponsors.*

THE FACTS: This is an excellent example of the misleading claims being made by the Pay-To-See group. Pay-To-See Tv is not an added service. Actually, it takes away service now available to set-owners free of charge. Broadcasters, it should be remembered, will always have to *substitute* a slot machine program for one they have been offering free. Furthermore, when the *same* time is used, how can it mean additional revenue?

CLAIM: *If the opening night of a Broadway play were put on Pay-To-See Tv enough money would be obtained from a nation-wide audience to pay the cost of the play's production.*

THE FACTS: But if this were done, would you have a theatre left in this country? Also, who has specified what the cost would be?

In the above, no mention whatever is made of damage such a program would bring to the theatrical road-companies. Nor is there any mention of what such a program would do to at-



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tendance at the Broadway theatre where the televised play is housed.

There is no doubt that such a program would pay for the costs of the play's production. The fact is that it could return it a thousand times over . . . and the fact is that none of this additional revenue would find its way into the hands of talent and other employees deprived of an opportunity to work in theatrical road-companies.

CLAIM: *Hollywood, Broadway, and television itself would benefit from the surge of economic support from the living room box-office in Pay-To-See Tv.*

THE FACTS: Let no one forget the common practice among producers to raise prices when they have a good attraction. Once Pay-To-See Tv has a nation-wide audience, the television stations will have to yield to the demands of Pay-To-See promoters or not get the product. Moreover, if there is only one source of distribution, who would get what?

CLAIM: *Pay-To-See Tv would make it possible for many events, now televised exclusively to theatres or "blacked out" in towns where they are staged, to be seen at home.*

THE FACTS: The few "black-outs" in sports lend great support to the case for Free-Tv. Advertisers have been bringing the public championship fights, World Series, and football—all of which are available free to the viewing public. Moreover, theatre Tv does not use Free airways, but pays established rates to a common carrier for a closed circuit for its events. Here again, there is evidence of Pay-To-See Tv's basic unfair competition.

CLAIM: *Pay-To-See Tv would give all sports needed economic support with a home box-office, especially college athletics and minor league baseball, two important victims of the televising of sports without a box-office.*

THE FACTS: The above contains a transparent fallacy, to wit: the poorer teams who draw no attendance at the gate are certainly not going to draw attendance at home. Furthermore, people still pay to watch football in stadiums, while others still get it free on television.

Pay-To-See Tv's argument that it would be only a part-time service is simply not true. Baseball, obtained free today, almost always consumes between 2½ and 3 hours, meaning, of course, that all other programs on that channel would be cut off.

CLAIM: *Pay-To-See Tv would help the movie theatres by stimulating interest*



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in movies and greatly increase the output of films.

THE FACTS: The above contains a basic contradiction since it is a well-established fact that a large output of films invariably means inferior films, hardly fit to be called "premium" entertainment. Again, it entirely overlooks the disastrous economic consequence to movie-house employees and to thousands of people employed in related fields, restaurants, transportation workers, etc.

Finally, Pay-To-See Tv in no sense guarantees a stimulus for interest in the movies. The interest is there now . . . and only good pictures can be the stimulus.

CLAIM: *College students would find it possible to accumulate as much as half or more of the necessary credits for graduation at home, and with far less expense than when actually attending college. This would make degrees possible for thousands who cannot afford the time or expense of four full years of "on campus" residence.*

THE FACTS: Just words without rhyme or reason. It would lead to the most superficial educational processes imaginable, and establish education without standards. Television education can be useful as a supplementary factor, but not beyond that, as 99% of our educators will attest.

CLAIM: *Pay-To-See Tv would greatly multiply the total audience for Tv, by making more stations possible, especially in the smaller towns, and by giving more people reasons to buy and use television sets.*

THE FACTS: Those who do not have Tv sets today almost certainly can't afford them, which would make the above claim nothing short of ridiculous. Another point is this: if a station can't operate successfully in a "free market" because it can't attract a large enough audience, it certainly can't hope to succeed when programs have to be paid for.

CLAIM: *We have the solution to the economic problems that have reduced the status of the opera and symphony.*

THE FACTS: Any lack of status incurred by the opera and the symphony is highly debatable and would certainly have to be proved. What Pay-To-See Tv actually is saying here is that it, by itself, is going to elevate the musical tastes of millions of people. That is rubbish.

CLAIM: *Pay To-See Tv would give the public the kind of top entertainment that advertisers cannot afford to sponsor.*

THE FACTS: Any entertainment that advertisers can't afford to sponsor would be so utterly unfamiliar to the American people that it is extremely unlikely that they would accept it. Besides, what artist, show, or program has failed to get an airing?

CLAIM: *Pay-To-See Tv would help advertisers, even though it took away some of their air time, because it would make for more stations and permit reduced rates.*

THE FACTS: Free-Tv and Pay-To-See Tv cannot co-exist. It would become unprofitable, eventually, for advertisers to sponsor Free-Tv, owing to the alienation of part of their audience to Pay-To-See Tv. In Tv, small audiences lead to less programming, until the point where there would be little or no Free-Tv at all.

MAGNETIC PRINT DATA

(Continued from page 17)

netic field—a method which does not give as good results as re-recording on the print tracks.

Mr. Grignon implies, however, that an actual re-recording technique is employed by Fox in the preparation of magnetic-track release prints. We are open to correction.

Deterioration Breeds Distortion

Another factor of great importance is the proximity of the magnetic-track material to the reproducing head of the "penthouse" reproducer, as error in this respect produces severe second-harmonic distortion. We regard the standardized gap distance as correct for reproduction of magnetic tracks of the C'Scope variety, but are totally unable to grasp any advantage of the *very slightly* superior high-frequency response of this system when *both* the prints and the reproducing heads are new and in good condition.

Beyond a certain point of wear, the magnetic heads deteriorate in a

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rather spectacular manner, and unless the soundhead has been designed for good contact of the film with the heads, distortion is inevitably present. Optical sound performs ably even in spite of slight soundhead wear and print deterioration. In other words, optical sound is stable and dependable, whereas magnetic sound is not.

What Mr. Grignon says about extending the low-frequency range with a raising of the high-frequency end of the sound response is absolutely true, and a lesson equally applicable to optical sound. In practice, C'Scope magnetic sound reproduction cannot go much below 50 cycles because of the design of the amplifier transformers made by most of the commercial manufacturers of sound equipment.

The same limitation applies to optical sound; but the reasons are different—ground noise and low output power of the average theatre amplifier. Moreover, satisfactory reproduction of the lower frequencies —down to about 35 cycles—demands low-frequency speakers of larger and more rugged design than anything that has yet been offered by the commercial manufacturers.

Cyclic Cut-Off Point

It is a defect of the Perspecta "pseudo-stereophonic" system of optical-track reproduction that it cuts off from reproduction everything below 70 cycles. In the matter of low-frequency reproduction, therefore, C'Scope magnetic sound is superior to Perspecta sound, as presently constituted. This is not a limitation of optical sound, however, for an adequate theatre sound system will render audible frequencies as low as 60 cycles from standard optical tracks, although with very great attenuation of the signal.

The question of C'Scope magnetic *vs.* standard optical sound for theatre use has been settled, it seems to us. This, we might say, is a fact of commercial life and in no wise diminishes our admiration for Fox or for the manifest skill and ingenuity of Fox engineers.

Like many other motion picture processes (our memory goes back to sound-on-disk, a system superior to the optical sound of its day) magnetic sound reproduction finds its days numbered. While all five of the major producers in Hollywood have been doing a fine job with it, all except Fox have conceded to the viewpoint of Paramount and concentrated on the technological advance of optical sound with the intention of totally abandoning magnetic sound.

It is possible that the 2½-channel stereophonic sound system of optical-track reproduction, known as PhotoStereoSound,[1] will eventually be adopted as standard.

[1] Dr. John G. Frayne, "New PhotoStereo Sound System", I. P., p. 24, June 1955.

BLACK-AND-WHITE FILM

(Continued from page 15)

base. The earlier acetate films were unsatisfactory as regards their physical properties. They retained more solvent than nitrate film, and as this solvent evaporated they shrank, until finally they might not fit the sprockets. The shrinkage also manifested itself as buckle and curl.

Nevertheless, safety positive film was made in appreciable quantities before 1916 and has been made ever since. It was absolutely necessary for projectors used without a projection room. Safety film, as will be seen Improvements in the acetate base were continuous until 1950, when a marked change was made by the adoption of later, also played a great part in the development of the 16-mm program. triacetate base.

Cellulose triacetate gives much improved physical qualities to the base, compared with the earlier material which contains slightly less acetyl in the structure of the molecules. As a result, the triacetate base proved to be as suitable as the earlier nitrate base. In 1950 nitrate base was discontinued, and from the beginning of 1951 all film has been made on the

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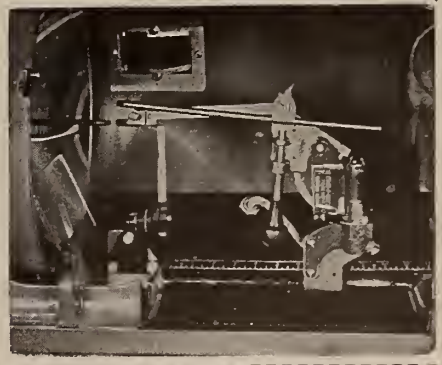
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Wide-Scale 16-mm Development

The first 16-mm film was introduced in 1923 as part of a program of home cinematography. An orthochromatic film, Type 5204, was first manufactured in May 1923 under the name of Kodak Safety Film for the Cine-Kodak and other cameras using 16-mm film. This film, after exposure in the camera, was from the beginning developed by a reversal process to a positive and used as a final print for projection. It was this system which was responsible for the success of the 16-mm program which has had such wide application in the whole development of motion pictures.

Panchromatic Cine-Kodak Film, Type 5255, was placed on the market in 1928. The camera film was first supplied for daylight loading with a paper leader. Many experiments were made on the use of an opaque backing to avoid the troubles involved in the use of the paper leader. Finally, in 1931, a jet-black backing was made which gave the necessary protection to the film and which was removed in the processing machines.

Supersensitive Panchromatic

Supersensitive Cine-Kodak Panchromatic Type 5256 was introduced early in 1931, and this was replaced in 1939 by Super-X Cine-Kodak Panchromatic Film having the same type number, 5256, which is a current product. In 1938 Super-XX Cine-Kodak Panchromatic Film, Type 5261, supplied the need for an ultra-speed reversal film.

Undoubtedly, new black-and-white films for use in motion-picture photography will be introduced from time to time and will embody improvements made possible by the advance of the emulsion-maker's art. The future of motion-picture photography, however, involves the use of color, and the principal advances in motion-picture films will depend upon the improvement of the materials and processes used for color photography.

DAMAGE TO PRINTS

(Continued from page 10)

degree of tightness. Loose winding may be avoided by maintaining proper tension of the "dummy" brake. Loosely-wound rolls of film should be rewound twice more, and never tightened by pulling down on the *outer* lap of film.

The speed of the motor-driven rewinder should be somewhere between 2½- and 5 times normal projection speed. That is, a 2000-foot reel of film should rewind in from 4 to 8 minutes. Faster rewinding may damage the film; slower rewinding is a nuisance.

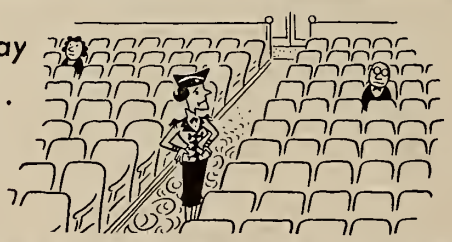
Vibration on the reels and sidewise film-slapping on the rewinder make an even rewinding impossible. A few projectionists have devised flanged guiding rollers under which the film passes on its way from one reel to the other. Such rollers must be "faced" to contact only the perforation margins, never the soundtrack and picture areas.

Rewinder elements are sometimes deliberately misaligned so that the film rubs against the reel flanges and is thus guided into an evenly-wound roll. This method, unfortunately, results in

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roughened and nicked edges, torn perforation margins, and damaged splices. Curved diagonal abrasions are sometimes produced when the film is held manually against a reel flange during rewinding.

Even-Tension Winding Necessary

Rolls of film having convolutions with protruding edges are readily damaged when *forced* into shipping cases. The edges of the film may become bent or entirely broken, necessitating costly replacements. This is why exchanges prefer return of prints as they wind up in the projectors at the last showing. The lower sprocket of a projector insures smooth, even winding, provided that the take-up tension be properly adjusted. Many projectionists, nevertheless, dislike to use shipping reels in the lower magazines, but accidents seldom occur if the reel flanges are "spread" and the magazines are wide enough to accommodate such reels without scraping or binding.

Film should wind up in the projectors with sufficient tightness to prevent undue sidewise movement of the film layers during shipment. Lateral abrasions usually result from movements of the film layers during shipment, abetted by the uneven transit of the film through the gate.

Most commercial motor-driven rewinders have automatic shut-off switches to prevent violent slapping of the end of the film with damage to the leader. Many projectionists have devised excellent shut-off switches, some having seen more than 30 years of service with no signs of serious wear.

Dimensional Deformations of Film

Motion picture prints are subject to a number of dimensional defects.

"Curl" is the most common dimensional deformation of film. Some degree of curl is present in all film and is seldom deleterious to projection quality. Curl is due to dimensional differences between the emulsion layer and its support, or film base, and is caused by changes in the moisture-content of the emulsion and solvent-content of the support. Air constantly changes in relative humidity and temperature and the emulsion absorbs and releases moisture in accordance with these atmospheric changes. A flat piece of film held close to an ordinary light bulb will immediately curl with the emulsion side of the film concave. This is caused by loss of moisture from the gelatine emulsion.

The fact that the film base retains much of the curl imparted to it, even after all the emulsion has been removed, indicates that the structural strain of curl may become a more or less permanent characteristic of the film.

Curl is said to be "normal", or positive, when the emulsion side is concave; negative when the emulsion side is convex. Most film curl is positive. It will be noted that positive curl is induced in a flat piece of film no matter which side is presented to the warmth of a light bulb.

"Spoking" is the term applied to the wavy appearance of the convolutions of a loosely-wound roll of film having either a high degree of curl or a permanent "twist."

Edge-Weaving of Film

"Twist" is a weaving of the film produced when the edges are longer than the center section, caused by loose winding of freshly processed rolls of film under adverse atmospheric conditions. When fresh film is wound loosely with the emulsion side "in", and stored under excessively dry atmospheric conditions, the undulations alternate from one edge to the other. If the film be wound emulsion-side out and stored under the same conditions, the undulations are directly opposite each other.

When the edge-waves do not extend to the center of the film, but affect only one or both of the margins, twist is called "film-flute." Twist is usually

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a permanent deformation that produces a troublesome in-and-out-of-focus flutter on the screen.

"Buckle" is the opposite of *twist*. The edges of buckled film are shorter than the center section, giving the middle area of the film a characteristic humpy appearance. Buckle is due to temporarily shrunken side margins. Less severe buckling is caused by contact of the perforation margins of fresh film with excessively hot gate-runners and tension pads during projection.

The darker areas of the photo-emulsion do absorb heat. However, the interval of exposure to the arc beam is so brief that only the outer surface of the emulsion is raised to a high temperature, the base remaining relatively cool. In fact, the emulsion may even become blistered by irradiation without appreciably heating the base. Contact of the perforation margins with the hot gate rails and pads, on the other hand, heats *both* the emulsion and base in these areas by direct conduction, (cooled gates exempted).

The effectiveness of water-cooled gates is proven by the fact that the film winds up "cold" in such projectors even when the arc beam is strong enough to blister the emulsion.

Buckled film assumes a pin-cushioned form over the projector aperture. "Buckle" is called positive when the emulsion side is concave (the film bulging toward the lens) and negative when the emulsion side is convex (the film bulging toward the light source). "Normal" buckle is negative, the film bulging toward the lamp. Severely buckled film flops in-and-out of focus. *Increasing the gate tension does NOT materially reduce the fluttery effect of buckled film!*

Causes of Embossing

Embossing is a deformation produced by the effect of heat absorbed by the emulsion of the picture areas during exposure to the hot arc beam at the aperture. Each frame is exposed for two 1/96-second intervals when projected, with a 1/96-second blanking-out interval separating the exposures. Even this brief "flashing" is enough to expand the picture area so that the frames are raised above the general level of the film. Repeated projections increase the effect, until the frames can easily be seen to stand out like small cushions. Projection with extremely high-powered arcs may even *emboss* the photographic images, giving them the appearance of bas-relief carvings when examined by reflected light.

Embossing does not seriously impair the quality of the screen image, although when embossed film is spliced to unembossed film, the slight shift in the distance of the image from the lens when the splice passes by the aperture may require refocusing.

"Focus drift" and "flutter" are special effects common in 35-mm film projection. They may be caused by arc heat or other factors. Focus drift is generally regarded as a normal phenomenon which must be accepted by the projectionist, especially if lenses of short focal-length are used, in order to maintain a crisp focus on the screen at all times.

Because the convolutions, or individual turns, of film are smaller near the center of a roll than those near the outside, the amount of curl in the film is usually greater near the end of any reel. As the showing of a reel progresses, therefore, the slight degree of concavity of the film over the aperture gradually increases, moving the photographic image toward or away from the lens. Unless the focus be sharpened once or twice during the projection of a reel of film, the picture on the screen becomes increasingly blurred.

Flutter of the film over the aperture is often plainly visible on the screen, and is usually due to buckled film. There is no remedy for this condition.

The Arc Power Factor

Projection *via* powerful arcs causes a different kind of film flutter which becomes most pronounced during the second or third showing. The emulsion side of the film begins to expand when the intense light beam strikes it, and, accordingly, the film image moves *away* from the lens. The film begins to return to its normal position during the blanking period when the balancing blade of the shutter cuts off the light. *The expansion resumes during the next exposure.*

Now, this type of flutter is so rapid that it gives the effect of poor focus. It is impossible, however, to correct this condition with the focusing knob because the film moves back and forth *twice* during each "dwell" period when the intermittent sprocket is at rest.

At the very highest intensities, the film buckles and flops in and out of focus visibly. No projectionist can follow these irregular movements of the film to obtain a good focus. A light beam powerful enough to produce this very severe buckling may also destroy the print by blistering the emulsion. This phase will be considered subsequently.

[TO BE CONTINUED]

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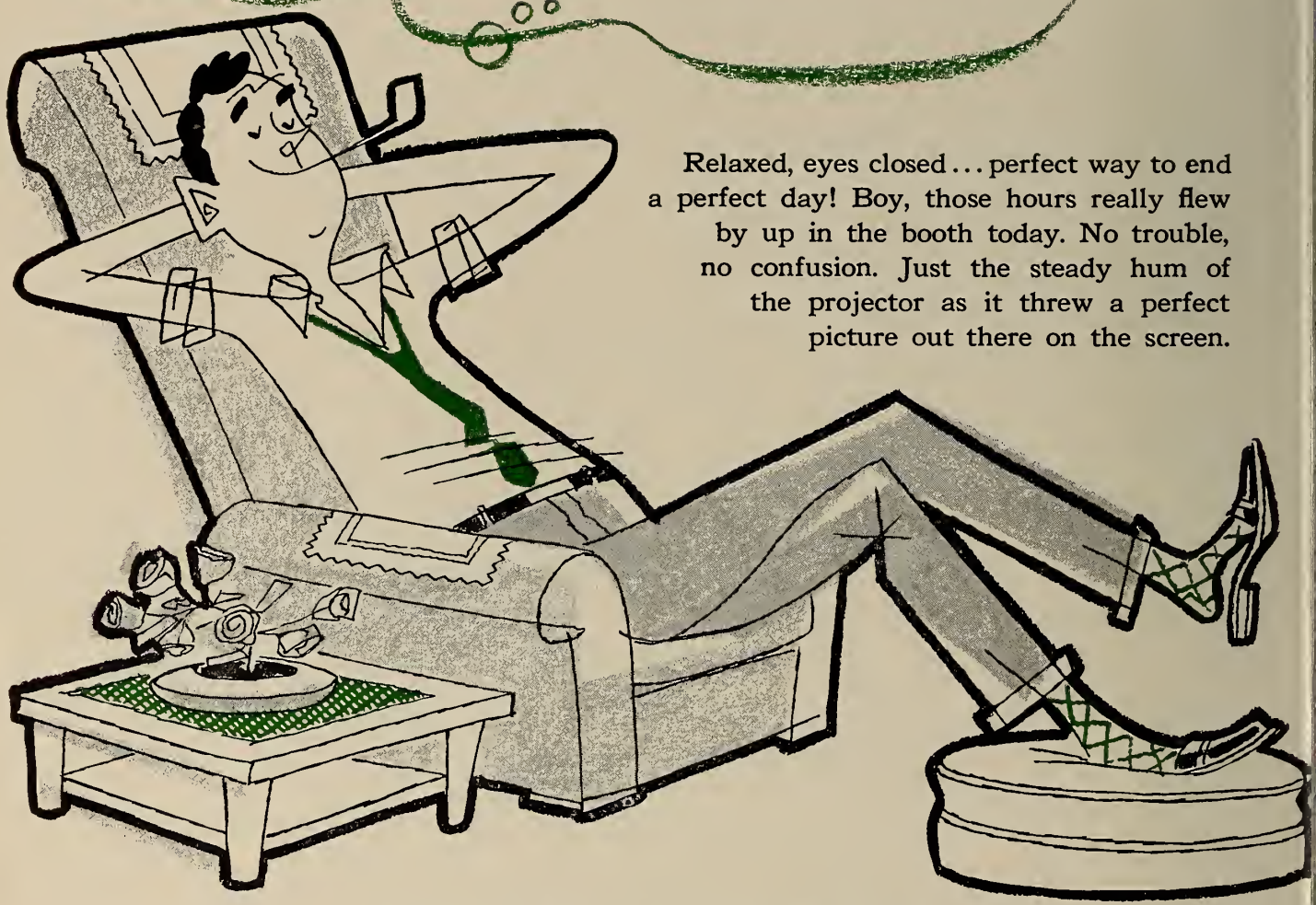
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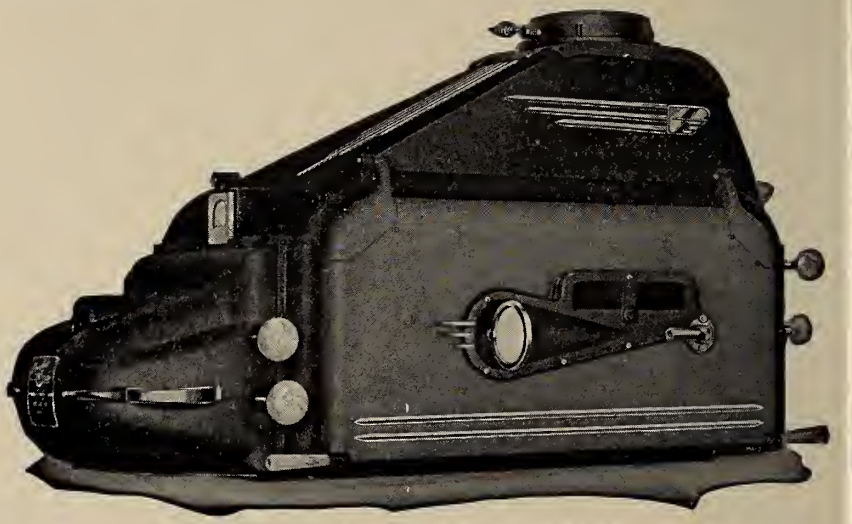
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Monthly Chat

ORDINARILY IP ignores the bleatings of the uninformed, in both the trade and lay press, relative to real or fancied shortcomings in the reproduction of picture and sound in theatres. Very often we are in agreement with such blasts, particularly regarding sound level, a matter solely within the province of the house staff because of the projectionist's total inability to gauge auditorium sound volume by means of his room monitor.

Such criticism of *conditions*, even by the uninformed, can do no great harm; in fact, it might accomplish not a little good in effecting improvement. However, when it comes to assessing the *blame* for such conditions, that is another horse and one that IP won't back.

Just such a critical foray as the latter was indulged in by one Edward Connor in *Variety* for July 13 last (see page 17 of this issue). Now, much that Mr. Connor has to say is factual and wins IP agreement. There is no means readily at hand for assaying Mr. Connor's qualifications on the technological front, but when he charges that the ills he enumerates are chargeable *directly and solely* to projectionists, IP states bluntly that he's talking through his hat. The high standing and wide circulation of *Variety* in the industry serves to compound the injury done to the craft by Mr. Connor.

Even as the IP office was preparing a reply and a rebuke to Mr. Connor, our volatile contributing editor, Robert A. Mitchell, beat us to the punch from afar (also on page 17 herein). Robert A. did himself proud, as usual, in his classic contention that "if it ain't on the print, we can't show it." But this phrase fails by a wide margin to tell the whole story. True, the *image* on the film is a vital factor; but what about the print itself?

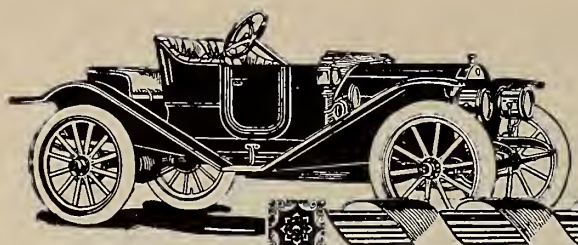
Complexities of Projection Process

Does Mr. Connor have the remotest idea of the scores, literally, of hazards that beset the transit of film through a projector mechanism and which effect vitally the focus of the screen image? Is he aware of the effects upon the projected image of vertical and horizontal drift or improper tension, or "green" or old prints, or beat-up equipment, or the blistering effect of modern carbon arcs pulling a goodly amperage?

We challenge Mr. Connor to attempt under existing projection practice — new film, old film, CinemaScope or other wide-screen process, and even our old friend the 3 x 4 proportion — to maintain proper focus throughout the run of a single feature. We'll gladly escort him to the finest-equipped projection room in the New York area for the test. We'll also bet him $100 that neither he nor any professional projectionist of his acquaintance will turn the trick.

Maybe the tip-off as to Mr. Connor's proclaimed erudition in projection matters is his statement that motion pictures on Tv are superior to the screen image in the theatre. Let it be said here and now that Tv film projection is not only bad — even with new prints made by the networks under careful control — it's hideous.

Anytime you're ready, Mr. Connor.

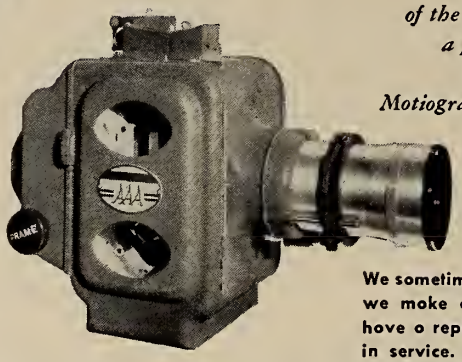


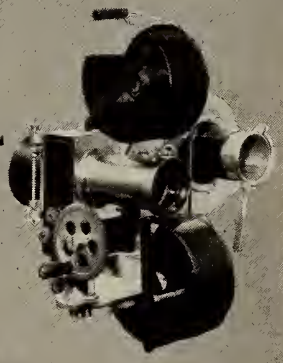
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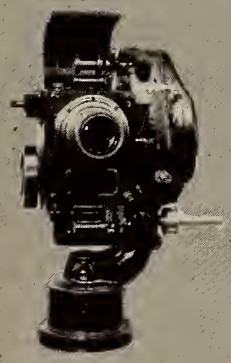


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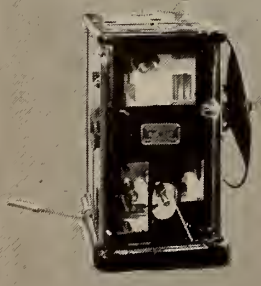
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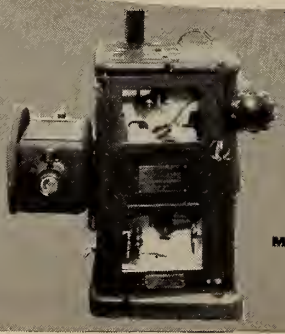
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INTERNATIONAL PROJECTIONIST

VOLUME XXX AUGUST 1955 NUMBER 8

Projection Room Booby-Traps

By JOSEPH HOLT

IATSE Local 428, Stockton, California

DEVELOPMENTS of recent years have given the projectionist the opportunity to present brighter, wider and more impressive screen images; but with these advances on the technological front have come what the writer refers to as "projection room booby-traps".

Consider the very popular lamps which use circulating water or other suitable coolant around the positive carbon at the point of support nearest the crater. The usual insallation of these lamps provide a connection to the water mains with a manually-operated valve controlling the flow of water.

Jacket Walls Ruptured

Such a condition means that someone must remember to open the valve before the arc is struck. Experiment has shown that in the case of lamps operating below 100 amperes it may be quite possible to operate for short periods of time without water; yet if water be introduced after the cooling jacket is well heated, the walls will be ruptured and the jacket destroyed.

So well agreed are projectionists that the danger exists that it is quite common to see hand-lettered signs calling attention to the necessity of opening the water valve before projection begins.

But is it wise to leave this matter to comparatively haphazard methods when simple control methods are at hand? The writer proposes that more positive means be used, and suggests the following devices, each of which he has personally used and can vouch for their effectiveness.

The wheel of the water valve may be mechanically connected to an electrical switch in such manner that the contacts are open when the water valve is closed. This means that the arc power source may be controlled through its magnetic switch to prevent its starting unless the water valve is open.

Various flow indicators and pressure switches can be used to warn of decreased or interrupted water flow. Any competent projectionist can design his own protection system once the idea has been left with him.

Use of Dual Soundtracks

The use of both optical and magnetic tracks in CinemaScope prints has brought one of the most diabolical booby-traps to the current projection scene. In many rooms it is customary to skip the optical soundhead when threading a magnetic reel, and *vice versa.*

With house leaders being used to provide convenient threading and starting footage, it is asking too much of the projectionist that he keep the track category in mind for each reel in the program. It is therefore once again good practice to look for methods which will provide the double check.

The writer has found that the least errors occur in rooms in which the nature of picture and sound encountered on each program unit is recorded either on the schedule sheet, the routine sheet posted by each projector, or written on the leader if this is of the type which does not already carry vital information. Possibly all three methods are not overdoing the matter, and any one of them will go far toward preventing those mysterious silent passages which are invariably succeeded by program interruptions which are difficult to explain.

Switching of Channel Speakers

But the harnessing of magnetic and optical sound equipment to the common speakers in the screen center provide one of the worst conditions to be encountered today.

Switching of the channel No. 2 speakers from optical to magnetic and back again is usually accomplished either by means of a relay or manually-operated switch.

This switching may be in itself done in such manner as to provide the maximum inconvenience to the projectionist, but the fact that in almost every case the optical monitor is so located in the circuit as to be independent of magnetic-optical switching is almost criminal negligence.

In short, if corrective steps such as are suggested herein are not taken, an ever-present possibility exists that by personnel or equipment failure the optical power amplifier may not be connected to the channel No. 2 speaker stage lines. Meanwhile, the optical monitor operates at full normal volume while no sound is being transmitted to the patrons.

Certainly this condition should be removed, and the writer suggests that a partnership between the sound service man and the projectionist should be initiated to erase this particular cause of faulty projection.

Recent Developments in Anamorphotic Systems

By G. H. COOK

Member, The British Kinematograph Society
Technical Staff, Taylor, Taylor and Hobson, Ltd., London

This inclusive article relating to the development and practical application of anamorphotic lens systems to motion picture exhibition, originally given before the British Kinematograph Society (Theatre Division), reflects the British knack for speedy marshalling and public dissemination of factual data anent current developments.

THE term "anamorphosis" as applied to optical systems implies an arrangement in which image formation occurs on different scales in the vertical and horizontal directions. There is, therefore, at some stage between camera and theatre screen, *deliberate distortion* of the original scene which must be compensated for before viewing.

The use of anamorphotic systems in itself does not provide any startling change to the appearance of screen pictures. It is a means of providing wide-screen pictures of the so-called panoramic type while avoiding some of the practical difficulties which prevent conventional systems from providing an adequate performance standard.

The limitations on the dimensions of large screens are set by the width available within the architecture of the theatre, and for height by sight lines from the rear of the seats past the balcony overhang. These limitations (and to a smaller degree the desirability of avoiding extreme picture height for viewers near the screen) spurred the adoption of pictures formats whose aspect ratios (width to height) is up to twice the conventional ratio of the 1.33/1 standard for many years on small screens.

Contentions vs. Performance

The sponsors of wide-aspect ratios contend that they permit the composition of a more interesting picture, especially if the scale of the image detail on the screen is maintained near its normal value by the use of wider-angle camera lenses embracing more extensive fields of view.

The assertion that the panoramic screen gives an illusion of depth *is not substantiated by any optical characteristic of the screen image*, having its genesis in what is called "extra audience participation."

Wide-Screen Projection Problems

When attempting to produce these large, wide-aspect screen pictures by conventional means and by standard projectors, two serious difficulties are encountered. One, the extra screen width has to be provided by shorter focal-length lenses—that is, the optical magnification between the film and the screen is increased and imperfections due to the presence of emulsion grain or lack of definition are exaggerated.

Second, the projector picture aperture has to be cropped, top and bottom, to provide the wider picture aspect ratio, therefore there is less light passing through this smaller aperture to illuminate a larger screen.

Detail Stored on Film

The visibility of the screen picture depends on a number of factors, but assuming adequate illumination and the use of a good projection lens, it depends mostly on the information stored on the film. The presence of grain in the film, either direct or reproduced from negative grain, plus the presence of camera lens aberrations and depth of field considerations, has the effect of limiting the amount of picture information that can be stored on the film.

Taking an average resolving power of 50 lines and spaces per mm. for the camera lens and film combination, we can consider the film image as a mosaic in which there are 100 individual picture elements per mm. When this is projected at a magnification of 500 times on to a 35-foot-wide screen, the picture is a mosaic where the size of each individual picture element is about ¼ inch. The visual acuity of the human eye is sufficient to discern this degree of softness of the image at distances up to about 35 feet from the screen.

Brightness of the screen image for any constant screen area is directly proportional to the total luminous flux passing through the projector gate. If the area of the gate were reduced by cropping top and bottom, the total luminous flux passing through it from the same arclamp would be reduced proportionately, and if this illuminated the same or a larger screen area, screen brightness would be reduced.

Both these types of difficulties relating to grain size, definition and illumination can be reduced by the use of anamorphotic projection systems. The variation of optical magnification in vertical and horizontal directions permits the projection of wide-aspect ratio pictures from projector gates whose dimensions make good use of the picture area available on standard positive 35-mm film.

Overall Film Area Content

The largest area that can be recorded on the film and projected by a standard projector has an aspect ratio of about 1.25/1. If all this area is to be projected on a screen having the CinemaScope aspect ratio of 2.5/1, the optical projection magnification must be twice as great horizontally as it is vertically.

To maintain correct geometrical reproduction of the original scene, the image on the positive film must be unnaturally compressed so that its scale horizontally is one-half its scale ver-

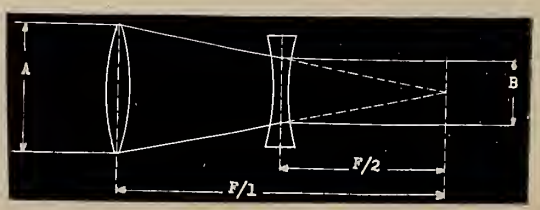
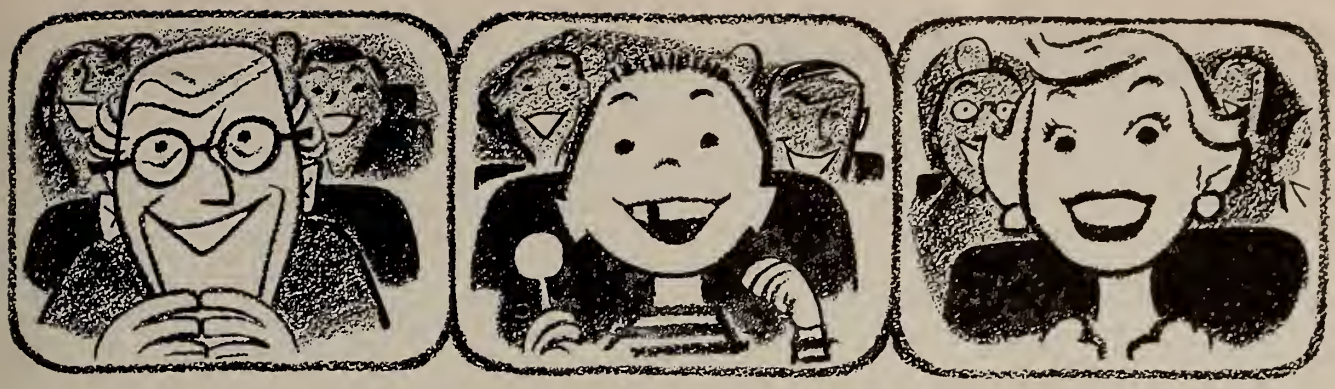


FIGURE 1
Simple telescopic system.
Telescopic Power:

$$\frac{F:1}{F:2} = \frac{A}{B}$$



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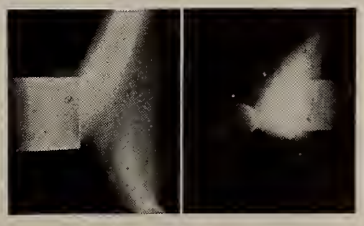
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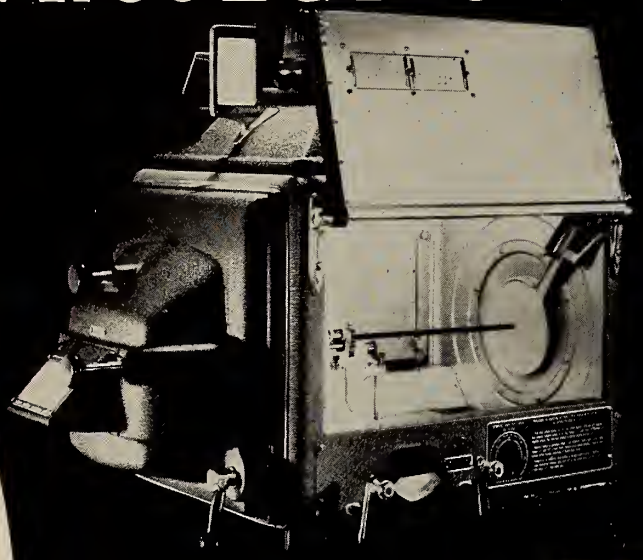
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- *The Automatic Crater Positioning Control System insures that both carbons are so fed as to maintain a correct arc gap length and to keep the position of the positive crater at the exact focal point of the reflector. Thus, the screen light is always of the same color, without variations from white to either blue or brown.*

- *The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.*

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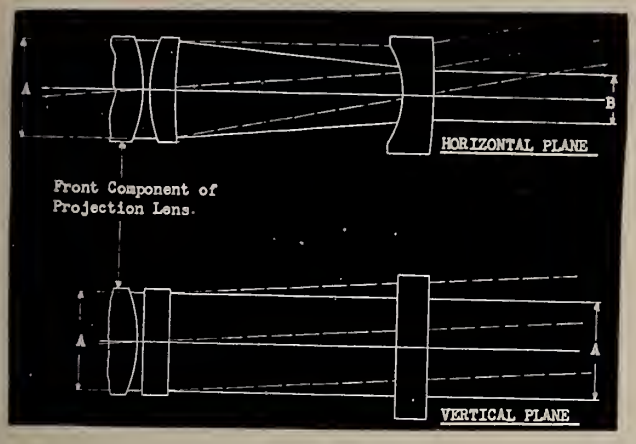


FIGURE 2
Layout of cylindrical system used for anamorphotic projection.

tically. Thus, if the original object seen by the camera was a circle, then the image on the positive film must be an ellipse, with its horizontal axis half its vertical axis. This ellipse on the positive film will be projected on to the screen as a circle.

Reduction of Negative Grain

A slide may be used to demonstrate in an approximate manner the anamorphotic reduction of the effects of negative grain and definition. These effects may be simulated by breaking up the image into a mosaic where the individual picture elements correspond to the maximum storage capacity of the film. These images when projected are enlarged considerably and should be considered as very small detail within a large-screen picture.

To compare the projected slide images, on the left of the slide may be the image which would be produced by straightforward projection at high magnification from a cropped positive picture area, and the coarse picture mosaic will be seen to have equal vertical and horizontal pitch.

On the right of the slide will be the image which would be produced by anamorphic projection onto the same screen, therefore the horizontal magnification will be the same as for the left-hand image. The vertical magnification from a maximum area projector gate, and thus from a large film area, had been halved, therefore in the vertical direction there would be twice as many elements per unit height. The overall effect of the right-hand image would show an improvement in apparent definition.

Increased screen brightness with anamorphotic projection was demonstrated by first projecting a wide-aspect ratio screen area from a top-and-tailed projector gate, and then by projecting a similar screen area anamorphotically from a normal gate having twice the height. A considerable increase in brightness was observed.

These are the basic reasons for the use of anamorphotic systems.

Available Anamorphotic Systems

Since the screen picture has to be increased in width, it is convenient to use supplementary wide-angle attachments in front of conventional projection lenses. To achieve the desired anamorphotic effects the attachment must have telescopic power *horizontally* and not telescopic power *vertically*.

Consider a simple telescope system such as that used in opera glasses. When the separation between the collective and dispersive components is equal to the difference between the focal lengths of the two components, parallel light entering at one end emerges from the other as parallel light. The telescopic power is then defined by the ratio of the two focal lengths f_1/f_2, and considering the geometry of this arrangement it can be shown that telescopic power can also be defined by the ratio of the entrance and exit beam diameters A/B. (Fig.1.)

If such a system has a telescopic power of 2 and it is positioned in front of a conventional camera or projection lens with its collective component near the lens, it will reduce the focal length of the combination by the factor 2 and double its angular field of view. Although the beam width is reduced according to the telescopic power, the focal length of the combination is reduced by the same factor and there is therefore no change in relative aperture or F number.

Cylindrical Prismatic Attachments

If the lens surfaces in such a telescope were cylindrical in shape instead of spherical, the system could have a telescopic power of 2 in the horizontal directions and have unit power vertically. Fig. 2 indicates the layout of a cylindrical system used for anamorphotic projection. The ratio A/B defines the telescopic power in each plane.

The optical design of the cylindrical type of anamorphic attachment requires just as much attention as the design of normal camera or projection lenses; the adequate correction of all aberrations can be achieved by the use of complex lens constructions comprising more than one lens element in each of the front and rear components.

The advantages of cylindrical anamorphotic attachments for cinema projection were first proposed and demonstrated by Professor Chretien in France some 25 years ago. The recent adoption of the method on a large scale has encouraged the development of a variety of cylindrical constructions.

Prismatic Attachments

In the search for alternative solutions to the optical problems involved in the design and manufacture of cylindrical systems, widespread use has been made of constructions employing *prismatic* components instead of lens components.

Figures 3 and 4 illustrate in a very simplified form the basic optical principle utilized in prismatic types of attachments. It comprises two wedge-shaped prisms inclined with respect to the light path in such a way that, in the horizontal plane, the ratio between the entering and emerging beam widths fulfills fundamental optical requirements.

By suitably inclining the two prisms in opposite directions, the emergent beam can be made parallel to the entrant beam (Fig. 4). In the vertical plane the flat polished surfaces of the

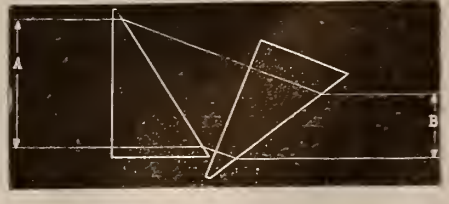


FIGURE 3
Optical principles used in the prismatic-type anamorphic lens.

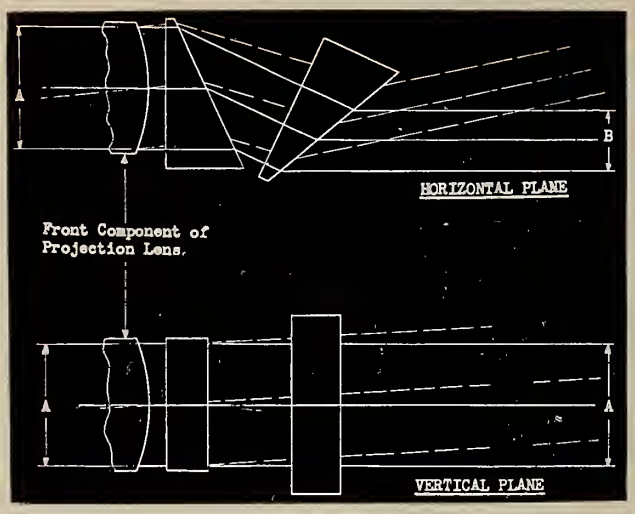


FIGURE 4
The prismatic anamorphotic attachment.

prism are parallel to one another and therefore have no effect.

Color Aberrations, Distortion

Prismatic attachments have one big advantage over all other types. They are readily adaptable to a form wherein the inclinations of both prisms may be *adjusted* to provide a range of telescopic power and thus varying degrees of picture expansion. This form will be of use to the exhibitor when he has to project different degrees of image compression. He thus avoids the necessity of using a number of different attachments each of which provides one *fixed* expansion ratio.

Although the opposed inclinations of two prisms provide correction for primary color aberrations, higher-order color aberrations are excessive and such simple systems cannot yield useful results. Furthermore, as a result of other aberrations, the telescopic power *varies across the field of view* and results in *distortion of the image.*

Adequate correction of distortion and color aberrations can be obtained by replacing the simple prisms by more complex forms.

The arrangement shown in Fig. 6 can be considered as the simplest construction to give an adequate performance at a fixed expansion ratio of about 2. This diagram also indicates a somewhat more complicated variable form which provides the same standard of performance over a small range of expansion ratios.

The prismatic developments thus illustrated were demonstrated first by the projection of a test object through simple uncorrected prisms. The color aberration was excessive, and it was explained that had the projection been over a wider screen, a variation of expansion across it would have been noticeable as a distortion of the image.

Correction of Errors

The correction of these two errors was shown by projection through a standard prismatic attachment whose expansion ratio was fixed at the factor 2 required for CinemaScope. Using the variable type, the performance was maintained over a range of expansion ratios from about 1.4 to 2 (Fig. 6).

Focusing Various "Throws"

One important feature arising from the use of *all* types of anamorphotic systems is the means adopted for focusing for different screen distances. The combined system of projection lens and attachment has different focal lengths in both the vertical and horizontal planes.

Since focusing movement of a lens is a function of its focal length, no single movement of the projection lens alone can focus *simultaneously* vertical and horizontal lines on the screen. In the case of cylindrical systems, two adjustments are necessary: one to the projection lens in the normal manner, and the other to the component separation in the cylindrical attachment.

With prismatic attachments the separation between components has no effect on focusing. Correct focus can only be achieved by setting the projection lens focused for an infinitely distant screen and utilizing at the front of the attachment a further supplementary lens system whose focal length can be adjusted to equal the screen distance.

This arrangement fulfills the condition that parallel beams of light enter and emerge from the prismatic attach-

(Continued on page 34)

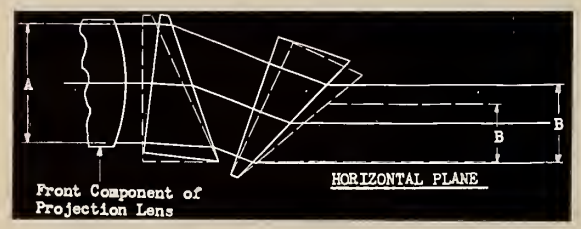


FIGURE 5
Simple prismatic attachment for a fixed expansion ratio. [See FIG. 6.]

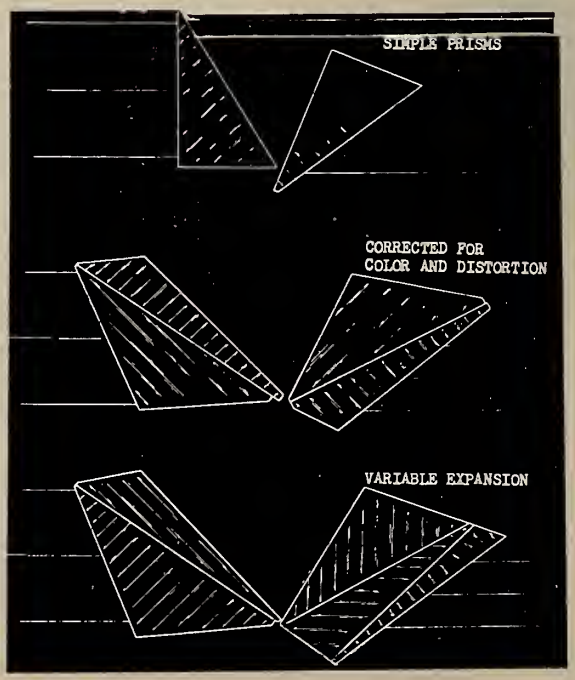


FIGURE 6
Prismatic attachment for variable expansion ratio. [Compare this drawing with Fig. 5 anent fixed expansion ratio.]

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Efficiency of Crater Brightness With Water-Cooled Contacts and Reflector Arc-Spot Temperatures

By CHARLES E. HAHN

J. E. McAuley Mfg. Co., Chicago, Illinois

TO completely understand the problems posed by the title of this article and their relationship to each other, the writer is firmly convinced that the interested reader should, first (before attempting to pursue further the subject) obtain and read the indisputed and authoritative scientific material on the question of arc-crater efficiency as set forth in the following literature:

April, 1949 issue of S. M. P. E. Journal, Volume 52, Pages 395 to 416.

Appearing on the aforementioned pages are two articles one of which is authored by Messrs. Jones & Bowditch, of the National Carbon Co.; the other by Wolfgang Finkelnberg, Development Laboratories, U. S. Army, Fort Belvoir, Virginia.

In the summary of each article, the *conclusions were identical* and each substantiated their findings with many graphs proving in substance that:

When using water-cooled contacts, one traded it for the highest degree of arc-current efficiency present in air-cooled arcs (arcs without water-cooled contacts) when each type arc was burned at *identical* amperages.

Now, these findings are of a scientific origin and are authoritative. They are not merely unsupported mouth-to-ear statements based on self-interest.

Higher Amperage Indicated

Both of these sources indicated further that when any *real* gain in illumination was made through the use of water-cooling, it was made *only* under certain specific operational conditions at amperages *higher than normally used* for projection service, and then only with specially-made experimental carbons of the high-brightness type, which have a high burning rate and are extremely expensive. Further, these articles make it very clear that *at equal amperages*, No gain in illumination was ever recorded when standard, present-day projection carbons were tested with water-cooled contacts.

These data should settle this question here, now and for all time. In our laboratory, after averaging dozens of side-by-side comparisons of each type of arc, each with the same optics and the same type of lamp, we found, in confirmation of the aforementioned articles, that to obtain the same amount of screen illumination from a lamp with water-cooled contacts as we did from one without water-cooling, we had to make an average increase in the amperage of the arc with water-cooled contacts to 112 as compared with 100 amperes.

In other words, the writer believes that 12% represents fairly the increase in amperage and the possible increase of carbon consumption rate that it costs under these conditions to use water-cooled contacts.

Reflector-Spot Temperature

Keeping the aforementioned facts in mind, one can understand why there is *some* truth to statements that "at equal amperages, the temperature of the aperture spot from a water-cooled contact lamp is lower than that from a lamp without water-cooling." This may be a fact *only* at identical amperages; *but* what about at *identical screen illumination levels?*

Again, after exhaustive tests, our laboratory ascertained that when the identical level of screen illumination was obtained on identical reflector lamps, with and without water-cooling, each having identical optics, one aperture-spot temperature was just as high as the other — but at this point the water-cooled reflector lamp was burning at 112 amperes, while the uncooled reflector lamp was drawing only 100 amperes!

Reflector vs. Condenser Spot Temperature

To resolve this question, our laboratory again averaged out the results of many comparative tests before arriving at definite conclusions. In this case, all readings of aperture-spot temperatures were recorded at identical screen illumination levels, because we were concerned only with the question: "How much hotter is the aperture spot from a reflector arc than that of a condenser-type arc, at *identical* levels of screen illumination?"

In our tests we employed 13-mm positive carbons in the Peerless Hy-Candescent Lamp which was equipped with our standard "Hy-Speed" condenser system, which was set to produce a light beam speed of F:2.0, at which speed we obtained a screen light distribution of 77%. For the reflector arc, we used 10-mm positive carbons and a lamp without water-cooled contacts but which did have an 18-inch diameter reflector mirror which we set so as to produce its advertised light beam speed of F:1.7 — at which speed we obtained a screen light distribution of only 56%. Aperture-opening sizes were identical, as were the focal length and the F:1.7 speed of the projection lenses.

Translating the results of our tests into a simple percentage figure, we found that the reflector-arc aperture spot averaged an 18% higher thermal impact level than the aperture-spot temperature from the condenser-type arc, and, mind you, this at the *same identical level of screen illumination.* Interpreting this result as it relates to projection, it actually means that heat-filtering devices must be used with reflector arcs at lower total screen lumen levels than with condenser-type, high-intensity lamps.

Lower Screen Lumen Level

We believe that the lower lumen-for-lumen aperture spot temperature of a condenser arc is due to the greater degree of infra-red absorption from the total light beam by the condenser lenses alone, which is considerable, as compared with the amount of absorption possible by the comparatively thin piece of glass comprising a reflector mirror.

As a point of further information, we mention here that when measuring these temperatures we employed a back-of-aperture baffle having a diagonal line of three holes, all of the same size, drilled in it so that we could record the temperature of the light at the upper left corner, center and lower right corner of the aperture opening. We found that even at the same level of total screen lumens, the temperature of the light beam at the center of the aperture, with the reflector arc, at all times averaged 21% higher than the condenser-type lamp.

Crater Magnification Factor

We are convinced that this condition is the inherent result of the basic characteristics of present-day, large-diameter high "F" speed reflectors and their individual crater magnification factors. It can also contribute to a considerable amount of damage to heat-filtering devices as does the lack of tolerance to crater position drift which is greatly reduced as reflector diameters and their light beam speeds are increased: this, in effect, can practically focus the crater directly on the filtering medium, with only a slight drift of the crater away from the reflector's geometric focal point, when its working distance from the aperture is set to coincide with the distances for which its ellipsoidal curve was mathematically computed or generated.

In conclusion, certain 18-inch reflectors (free diameter 17¾ inches) advertised to produce a light beam speed of F:1.7, when they are operated at a recommended working distance of from 36 to 37¼ inches, mathematically figure to produce light beam speeds of:

F:1.80 at 36 inches

F:1.85 at 37¼ inches

Prevention of Damage To Prints

By ROBERT A. MITCHELL

The third and final article of a series relating to conservation measures in the projection room.

BLISTERING of film emulsion is likely to occur when high-intensity (H-I) arc amperages exceed 80 amperes, no heat filters or air-cooling of the film at the aperture being used. A great deal depends upon the optical efficiency of the lamp, of course, and also on the transmission efficiency of the rotating rear shutter of the projector.

While certain makes of arclamp can be operated at 100 amperes without blistering the emulsion, more efficient lamps may damage the film in this way at arc currents as low as 70 amperes!

Tests prove that rotating barrel-type shutters (Motiograph, DeVry) are the most efficient on account of their rapid double action in cutting the light beam. The conical shutter as used in the Simplex X-L has a similar high degree of efficiency because it is positioned so close to the film plane. The old single-rotor, fan-type rear shutters are the least efficient of all, passing the least amount of light even when the blades are trimmed to the point where travel-ghost just appears.

'Blistering' of Prints

Lightly-blistered film shows a fuzzy, grainy spot near the middle of each frame on the emulsion side. The center of each blistered spot has a charred appearance where the bubbles of burnt gelatine have broken through. The color of the burnt spots is brownish-gray.

Examined on the base side of the film, the fuzzy, blistered areas have a whitish, milky appearance. The burnt areas are larger in cases of heavy blistering, sometimes covering the greater part of each frame.

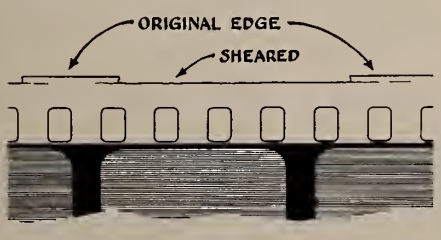


FIG. 1. Edges of film sheared by improperly adjusted pad roller.

Blistered prints are wholly beyond all possibility of restoration, and are totally unfit for projection again. Fortunately, there are two effective measures for preventing blistering, namely, infrared filters interposed between the lamp and the aperture, and air-cooling of the film in the aperture.

Water-cooling of the gate, so necessary for the prevention of buckling and physical deterioration of the film due to the effects of heat absorbed by the film base, fails to reduce the chances of blistering.

Worn, Maladjusted Equipment

Heat-buckling of the film and blistering of the emulsion, while more common than in the days of smaller screens, nevertheless comprise a small fraction of the damage inflicted on prints during projection. Aside from normal wear, most of the film damage specifically attributable to the projection process is due to worn and improperly adjusted equipment.

The scratching of prints is becoming an increasingly serious problem. We know definitely that much of this trouble is caused by CinemaScope magnetic soundheads. CinemaScope magnetic-track prints are frequently scratched by contact with the magnetic pickup and by impedance rollers which are scratched or burred, or fail to revolve freely.

Regular optical prints threaded to by-pass the magnetic reproducer are sometimes severely scratched by contact with the edges of the holes in fire-valve box and mechanism castings when the installation engineers have failed to provide the guiding rollers designed to keep the film from touching these areas.

Valve Rollers Prime Cause

Next to CinemaScope magnetic soundheads, the chief cause of scratched film today seems to be worn and jammed valve rollers in the upper- and lower-magazine fire chutes. Rollers which fail to revolve are rapidly worn down so that the middle part of the roller contacts the picture and soundtrack areas of the film and inflicts multitudinous scratches which have the appearance of "rain" on the screen and produce extraneous noise in the sound.

Periodic removal of accumulated dirt and film chips from the valve boxes is the best preventive of jammed rollers; but considerable criticism has been directed toward the design of these rollers. There is an ever-present danger of film-scratching when the middle portion of the fire rollers is not lathed down to a sufficient depth. Only the perforation margins of the film should be contacted.

Scratches and "rain" effects that weave from side to side on the screen can be blamed on the valve rollers in the upper magazine in nearly every case.

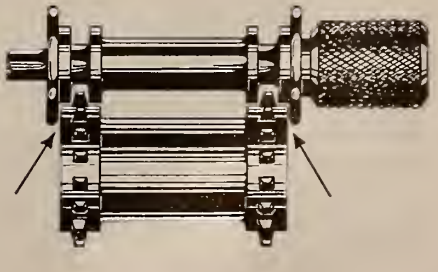
The valve rollers of most projectors require no lubrication beyond a drop or two of light oil at long intervals. As every projectionist knows, there are two types of valve-roller assemblies in wide use, the 3-roller and the 4-roller types The latter type is the most troublesome and difficult to service. Required by law in Massachusetts and a few other localities, 4-roller fire valves are much more likely to clog and cause film breaks than the more popular 3-roller type.

The 3-roller valve assembly has two fixed-bearing rollers and a free roller which drops against them by gravity. The free roller accordingly contacts the film snugly, and yet is able to move away from the fixed-bearing rollers whenever a thick or buckled film splice passes through.

Size of Loops Important

Excessively large upper and lower film loops are another cause of scratched footage While there is danger in loops which are too small (they may pull tight and break if the picture is framed during projection) no loop should be so large that it rubs against any part of the projector

FIG. 2. Sprocket and pad roller. The arrows point to the places where edge-shearing of the film may occur when the pad roller is set too closeiy to the end of the sprocket.



mechanism. Intermittent scratches which produce "machine noise" in the sound are usually caused by oversized upper loops which strike against the mechanism casting.

Loops which are too large tend to be noisy. Excessively large upper loops also induce side-sway of the picture; and excessively large lower loops, besides interfering with the synchronism of the sound, increase the chances of the film jumping off the lower sprocket when a bad splice or a torn perforation comes through.

The upper loop should be made large enough to contact the guide-roller flanges and at least a little larger than is necessary to provide leeway in framing the picture all the way up or down. The size of the lower loop is predetermined by sound synchronization. There should be 20 frames between the frame in the aperture and the corresponding point in the soundtrack at the scanning beam of the soundhead.

Synchronization is easily checked when threading up standard leader. There is a sound-synchronizing diamond printed on the film exactly 20 frames ahead of the center of each footage numeral frame.

Adjustment of Pad Rollers

Pad rollers are those that serve to hold the film against the sprockets. Most projectors have one pad roller at the upper, or feed, sprocket; most have two rollers at the lower or holdback, sprocket to overcome the natural tendency of the film to jump this sprocket. However, the film is held against the face of the intermittent sprocket by a special shoe instead of a pad roller.

Shearing of the edges of the film by the pad rollers of both the projector mechanism and soundhead is very likely to occur when the pad rollers are not correctly adjusted. Film having a sheared "guided edge" (the edge nearest the projectionist as he stands at the operating side of the projector) weaves from side to side on the screen.

Lateral adjustment of a pad roller is accomplished by threading a short strip of undamaged film on the sprocket and opening and closing the roller several times rather sharply to find out whether the edges of the film are damaged thereby. If an edge of the film is nicked or roughed by the pad roller, loosen the set-screw and move the pad-roller arm in or out, as required, and tighten. Repeat the test until a position of the roller arm is found where the edges of the film are not injured by opening and closing the roller

Adjustment of the distance between the pad roller and the face of the sprocket is also very important, for if the pad is too close to the sprocket, it will "pinch" the film and abrade the emulsion either at the side of the picture or in the soundtrack, causing "frying" noises. On the other hand, if the spacing be too great, the film may jump the sprocket.

Simple Adjustment Cited

Thread the sprocket with two thicknesses of film and close the pad roller. Adjust the stop-screw until the point is reached where the two thicknesses of film are only very *slightly* loose with the pad roller in closed position. Then tighten the locknut.

When the film jumps a sprocket and runs without immediately tearing, the teeth of the sprocket produce a series of indentations in the film, a common type of damage called "sprocketing" and "roping." It is prevented by careful threading and by proper adjustment of the pad rollers, as outlined previously.

The intermittent-sprocket shoe may damage film *indirectly*. When misaligned, the inner surface of the shoe rubs against the sprocket teeth, wearing them down to knife-like edges. The teeth then cause small straight cuts which extend downward from the pull-down edges of the perforations and well in from the corners. Similar cuts are produced by the intermittent-sprocket teeth when gate tension is too great.

This type of injury to film perforations is more apt to occur when narrow-tooth sprockets designed for CinemaScope magnetic-track prints are used.

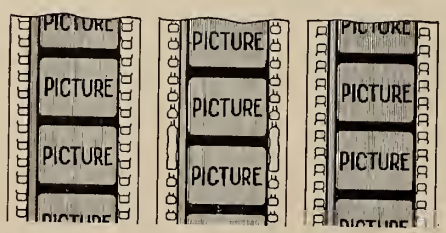


FIG. 3. *A* shows the result of excessive gate tension and too much tension on the upper-magazine reel spindle. Note that the corners of the perforations are torn on the pull-down edge. *B* illustrates the damage inflicted by worn intermittent-sprocket teeth and by narrow-tooth sprockets for CinemaScope magnetic-track prints. *C* shows the type of perforation damage caused by worn holdback-sprocket teeth and by excessive takeup tension.

Worn Sprocket Teeth

The condition of the intermittent-sprocket teeth is an extremely important factor affecting the longevity of prints. Undercut or hooked teeth roughen the pull-down edges of the perforations and even tear out chips of film from them. Film disengages from worn intermittent sprockets with a "tearing" noise, for hooked teeth prevent the film from leaving the sprocket freely.

Film with damaged perforations gives "jumpy" pictures on the screen.

The teeth of the upper feed sprocket are quickly worn by excessive tension on the upper-reel spindle. Some tension is absolutely essential to prevent a fully-loaded reel from spinning and piling up film in the magazine should the projector be shut down; but too much tension damages the pull-down edges of the perforations at their corners, particularly in the last 100 feet of every reel, and when small-hubbed reels are used.

The holdback sprocket of the soundhead "sings" when the takeup tension is too great. The teeth of the sprocket become hooked and the edges of the perforations opposite the pull-down edges suffer damage.

Certain projectors require greasing of the takeup friction clutch for smooth operation, but older projectors of the Simplex type work best when the leather friction disk is clean and free from oil. It sometimes happens that oil drips upon the clutch assembly from the soundhead or projector mechanism and makes the takeup action of the lower reel very irregular.

When in good condition, the friction clutch should be adjusted so that a fully-loaded 2000-foot reel will start revolving when the projector motor is switched on, but nevertheless easily restrained from turning by the touch of a finger to the reel.

Tension of Gate Pads

Gate tension is of great significance as regards projection results on the screen and print life. As a general rule, the tension of the gate-door pads should be such that the picture just begins to overshoot (jumping on the screen) when the projector is run at twice normal speed and a print in average condition is shown. But because modern projectors are equipped with neither handcranks nor variable-

(Continued on page 32)

Projection Expert—Unknown and Unknowing

Appended is a verbatim transcript of a letter to VARIETY which, because of the pre-eminent niche occupied by that publication in the world of show business, no less than its world-wide circulation, IP considers important enough to discuss in the Monthly Chat on page 5 of this issue.

Editor, VARIETY

In reviews of Tv shows your publication makes mention of the "lensing." I wish that you would similarly report on the "lensing" of movies in N. Y. houses. Motion picture projection today is nothing short of a scandal.

This last year-and-a-half I saw some 400 films in first-run, neighborhood and art houses, as well as private screening rooms, and in less than 10% were the films shown in focus. If a projector goes out-of-focus it stays out-of-focus, showing the man in the box isn't checking even once at the turnover. Is it lack of interest, lack of ability, stupidity? —or, as someone wryly suggested, just bad eyesight?

Certainly the quick demise of 3-D was due in great part to faulty projection, since the films were shown out-of-focus, out-of-alignment and out-of-synchronization, producing the blinding headaches the fans complained of. Correct projection of CinemaScope and VistaVision are likewise completely beyond projectionists today.

Managers and ushers manifest the greatest indifference when faulty projection is pointed out to them. The former know that you can fire a manager, but you can't fire a projectionist. Nothing will be done, of course, until people in numbers start to complain and ask for their money back. More don't do that, at present, because they think the fault is in the film itself, and because long suffering has taught them patience.

The steady loss of film customers to Tv has one big contributing factor that the pix people haven't faced up to: Tv shows—including the showing of movies, old and new — are brought into one's living room by *competent* technicians. Also, each Tv set is equipped with sound and focus knobs that a man can adjust himself.

If any N.Y. house would *guarantee* perfect projection and then follow through with same, watch the increase in box office receipts.

EDWARD CONNOR

To Which IP Replies:

By ROBERT A. MITCHELL, *Contributing Editor, IP*

Editor, VARIETY:

Complaints of poor focus in present-day movies — several of which have been voiced in VARIETY—are entirely justified. Not justified, however, is the abuse your correspondents have hurled at the projection craft. Conscientious projectionists resent getting blamed for a bad condition, which is not their fault.

Projectionists, by and large, are competent craftsmen who are every bit as perturbed by blurry CinemaScope and wide-screen pictures as is Edward Connor (VARIETY, July 13, p. 24). What the non-technical moviegoer does not realize, apparently, is that the picture on the screen can be no clearer than the picture on the film. And the photographic images printed on the release positive are very frequently at fault.

Better 40 Years Ago

Experienced projectionists will tell you that the average release print of 30, or even 40 years ago possessed higher pictorial quality, as regards image detail, than the average modern print.

All of the image-definition faults of standard prints are more highly magnified on the screen than they used to be in the days of conventional 3:4-proportioned screens. Moreover, the short-focus lenses required for widescreen presentation in all but the long, narrow type of auditorium exaggerate focus drift, film flutter, and "breezing"—projection defects which went practically unnoticed before the mammoth screen invaded the theatre.

CinemaScope poses special problems on account of the anamorphic lenses employed. These lenses, used on both the camera and the projector, frequently introduce slight geometrical distortions and blur the vertical edges of objects.

Outcome Not in Our Hands

Old hands at projection—skilled craftsmen in every sense of the word —deplore the poor images so often encountered in release prints. Defective prints handicap the projectionist in the practice of his art and inspire the unwarranted brickbats which come crashing through the projection-room window.

The non-technical critic ought to realize that the projectionist has nothing to do with photographing, printing, and processing the film. The man in the booth screens, to the best of his ability, the goop which is handed to him.

Color prints are a case in point. With prints made on Ansco Color and Eastman Color printing film, marvelously clear pictures may be expected. But most color prints for theatre use are made by the imbibition dye-transfer process, a method which is incapable of sufficient photographic resolution to withstand the acid test of terrific magnification upon modern wide screens.

Patrons annoyed by poor projection (and who isn't?) should complain, not to indifferent ushers, but to the manager of the theatre. The manager, like the projectionist, is intensely interested. An explanation of the trouble will then be demanded of the projectionist, and the projectionist, *the only trained technician* ply it.

If the quality of the picture on the screen does not then improve (and chances are that it won't) it may safely be concluded that the projectionist is confronted with a hopeless defect—a fault indelibly imprinted on the film, and hence irremediable. In such cases the projectionist always suffers more than the complaining patron.

Projection Optics in England

Projection Optics, Ltd., of London, England, subsidiary of the company of the same name in Rochester, N. Y., has been formed to manufacture and distribute Hilux projection optics for domestic and export requirements. Actual delivery of the Hilux-Val lens is now in progress, following various trade showings.

Westrex Co., Ltd., of London, will handle the distribution of these British-made optics.

Loew's Quarter Net Rises

Loew's, Inc., reported a consolidated net profit of $4,514,242, equal to 88 cents per share, for the 40 weeks ended June 9, as against $4,466,376 for the same period last year. Gross sales and operating revenues in the period totaled $141,272,000, compared with $138,250,000 last year, with profit in the last 12 weeks of this year's quarter dropping slightly to $1,239,791 from a comparable $1,267,210 in 1954.

Bodde Screen's New Plant

Bodde Screen and Projector Co., has opened new offices and a factory at 11541 Bradley Ave., San Fernando, California. The new plant will enable the company to increase its manufacturing facilities of seamless screens and projectors by 20,000 square feet of building area and offices.





Now audiences sit entranced ...sirens of the sea all around

They're there with their stars—within touching distance—*almost!* That's the thrill big-screen shows give *as nothing else in the entertainment-world ever has!* Part of it comes from size, of course; much of it is illusion; all of it is the result of new technics in production, processing and projection . . . technics which the Eastman Technical Service for Motion Picture Film is proud to have helped develop. Branches at strategic centers. Inquiries invited.

Address: Motion Picture Film Department
EASTMAN KODAK COMPANY
Rochester 4, N.Y.

East Coast Division
342 Madison Avenue
New York 17, N.Y.

Midwest Division
137 North Wabash Avenue
Chicago 2, Illinois

West Coast Division
6706 Santa Monica Blvd.
Hollywood 38, California





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New Yellow-Flame Carbons Increase Depth, Sharpness In Photographic Image

By CHARLES HANDLEY

Carbon Arc Lighting Engineer, NATIONAL CARBON COMPANY †

"If it isn't on the film it can't be projected onto the screen," is an old motion picture adage. The greatly enhanced photographic image described here must necessarily result in a greatly improved projection image. [See "What is (K°) Color Temperature" in IP for June last, p. 10.]

A new yellow-flame carbon for motion picture set lighting which provides a color distribution to match the sensitivity of present color motion picture negative makes it possible to produce pictures with much greater apparent sharpness and depth.

From one viewpoint it would seem that white light, which is composed of equal parts of red, green and blue and is represented by sunlight itself, should be the ideal balance for a photographic light source. An equally balanced white light source lends itself to easier color control when removal of some one color component is indicated, and above all, it is white light that provides most of the radiant energy for exterior photography.

The Matter of 'Color Balance'

The difficulty with the foregoing viewpoint is that incandescent tungsten lamps have certain advantages in motion picture photography, and when mixed with white light in color work, one must be filtered to match the other. It has been stated that at present it is possible to balance color film to that of a tungsten source on a much higher film "speed" rating to tungsten, and an equal speed rating to white light, than if a white light film balance were used. For this reason, apparently, professional color film is balanced to the tungsten source.

Since this change in color film sensitivity from white light to tungsten balance, it has been necessary on color sets to filter the white-light carbons to match the color sensitivity of the negative film with a resulting light loss of more than 40%. How this loss of light affected apparent sharpness and depth may be better understood by a brief review of set lighting practices.

† A Division of Union Carbide and Carbon Corp.



FIGURE 1

A scene from the Cecil B. DeMille spectacle, "The Ten Commandments," for Paramount. Director of photography is Loyal Griggs, A. S. C.

The motion picture is actually a two-dimensional medium. Physically it has only height and width. The illusion of depth in a picture is obtained by *suggestive* manipulation of perspective lines and planes. The relative size of objects is often purposely distorted in order to create the illusion of distance and scope.

Enhancement of Perspective

As an example, if the furniture in a room were made several times normal size, the characters would appear much smaller than normal. By gradually narrowing the walls, floor and ceiling of a hall it may be made to appear several times its actual length. These are physical techniques of perspective manipulation which add to the *illusion* of depth and reality.

Of equal importance are the perspective results which may be accomplished with the proper use and control of photographic light.

If adequate photographic exposure were the only requirement, it would be comparatively simple to light a motion picture set, provided the light sources were of sufficient intensity to deliver the needed radiant energy at the point of exposure. But an even amount of illumination results in "flat" light, and flat light means less object separation with its loss of apparent sharpness, clarity, roundness and depth.

It has been said that color itself will provide the separation necessary for satisfactory results, and for that reason, flat light, because of simplicity of use and assurance of overall negative density, is to be desired.

'Flat' Lighting Deficiencies

It requires only a small amount of analysis to overrule that type of thinking. Does a flower garden appear as interesting and breath-taking on a dull, dark day when the lighting is flat as it does when the sun casts myriads of variable density shadows to create the feeling of roundness and depth?

Does not the sunlight sparkle from the dew buds on the flowers add to the feeling of naturalness and beauty? A shaft of sunlight streaking across the garden wall creates the feeling of



FIGURE 2
Flying saucers, robots and men from another world are featured in "Forbidden Planet," photographed for M-G-M by George Folsey, A. S. C.

depth. Flat lighting is just—well, flat.

It is true that there must be photographic density in most areas of the negative in order to obtain a satisfactory print. This phase of lighting is called "base light". Once this base light is roughed-in, the director of photography utilizes controllable spotlights and a great number of translucent and opaque light-interference mediums to model the lighting. This is sometimes called "painting with light".

'Key' Lighting Indispensable

He illuminates the areas behind pillars to make them stand out, or they will appear as though they are painted on a backing. He places powerful, directional lights to cast their beams through windows and penetrate the base light, creating the illusion of sunlight streaking across the floor. He uses light to separate objects one from the other, or from the walls of the set. He keeps attention on his lead characters by key-lighting them.

He uses carbon arc spotlights to create dramatic shadow detail which adds greatly to the illusion of reality and the overall emotional effect on the viewing audience.

It should be remembered that the final objective of the picture is to move the audience emotionally and not to get just enough light to make a satisfactory exposure.

Sometimes these lamps are 100 feet, or more, from the objects they illuminate. It takes the very powerful carbon arc with its small source size to provide the carrying power, light volume and sharp shadow characteristics that are so vital to the success of this creative work.

Yellow-Flame Carbon Assayed

In the evaluation of the yellow-flame carbon a number of directors of photography were interviewed with the object of determining individual reactions.

Loyal Griggs, A.S.C., Director of Photography on the Cecil B. De Mille current production of "The Ten Commandments" said: "I don't know how I could have shot this picture without the added power of yellow-flame carbons. It was necessary to make a perfect match of the power, directional characteristics and brilliance of Egyptian sunshine.

'Directional, Controllable' Light

"De Mille sets have always been terrific in scope, but the sets for 'The Ten Commandments' are beyond the superlatives that might ordinarily describe them. We had to have directional, controllable light sources with double the photographic effect of anything in current use. Yellow-flame carbons provided the answer."

Figure 1 shows a scene from "The Ten Commandments" wherein Griggs has accomplished a duplication of natural sunlight and has cleverly produced a single-source effect even though a multiplicity of illuminants were used. Note how the shadow detail separates the characters from the walls and suggests form and depth to the huge blocks of stone.

Color Temperature Matching

George Folsey, A.S.C., who photographed "Forbidden Planet," a Metro-Goldwyn-Mayer picture which utilizes huge space ships, king-sized robots, and even other worlds, has this to say: "I have just finished shooting 'Forbidden Planet,' using the yellow carbons—the first picture on the lot to use them. I found them extremely satisfactory, and I had no difficulty with the color temperature matching the incandescent light. I found them especially beneficial in duplicating sunlight. They were a great advantage in maintaining sharpness as far as my long shots were concerned, and I am delighted that I had the opportunity to use them."

The photography in Fig. 2 shows the shadow detail, modelling and overall single-source effect Folsey created.

Joseph Ruttenberg, A.S.C., who directed the photography of the lavish musical "Kismet", a Metro-Goldwyn-Mayer picture says: "I am now using the yellow carbons on 'Kismet,' and the results are just fantastic, sharper definition and using less units on our big sets."

In Fig. 3 note how the shadow detail and highlights duplicate sunlight just as though the scene were shot in its true locale and under ideal light



FIGURE 3
Exotic settings are used in the M-G-M production of "Kismet," which was photographed by Joseph Ruttenberg, A.S.C.



FIGURE 4. A pastoral scene from the forthcoming M-G-M film "Diane," expertly photographed by Robert Planck, A.S.C. Such panoramic views are a heavy drain upon the technical knowledge and ingenuity of a cameraman.

conditions. The highlight areas are broken up by interesting shadow detail which separates one object from the other and from the set background, giving the illusion of depth.

Delicate Lighting Balance

Robert Planck, A.S.C., did some outstanding painting with light on his Metro-Goldwyn-Mayer picture "Dianne," which is laid in the 16th Century. Fig. 4 is a pastoral scene which required deft handling of all types of lighting equipment and controls in order to provide a soft but directional illumination and balance to keep the main characters as high points of interest while providing maximum object separation. Fig. 5 is another scene from "Kismet" in which sunlight coming through the window is carefully balanced with controlled "fill" light to properly illuminate the characters without too much "spill" light on the walls.

Harry Stradling, A.S.C., who was assigned to direct the photography on Samuel Goldwyn's picture "Guys and Dolls" almost snatched the new yellow carbons from the furnace in order to obtain the light volume and carrying power he needed for a huge double street scene. He had them brought out by airplane and put into production immediately.

"My early evaluation of the new yellow-flame carbons was fully justified," he said. "They provided twice the carrying power and light volume of any other lamp I could use, and they played a major part in the successful photography of the picture. They were particularly valuable in the shooting of the riotous Latin night spot scene where much of the light was coming through latticework and where it was necessary to use a high level of illumination and stop action with narrow shutter opening. I used all the 'Brutes' (huge arc lamps) I could get."

Previous Focus Compromise

Before the advent of wide-film processes and huge screens, the use of comparatively large camera apertures allowed some color pictures to be shot as low as 200 foot-candles for the key lighting. It was possible to compromise with depth of focus when shooting a large set for small-screen viewing because the theater audience could view the entire picture without scanning and, therefore, kept focus largely on the main action. Also, the objects in the long shot were so small that no attempt was made by the viewer to focus on individual characters.

Rather than providing true scope to the picture, these interior long shots were often merely a *suggestion* of scope that depended upon establishing medium shots and closeups to carry them over.

At the present time, with large-screen presentations, the viewer wants to recognize each character in a long shot and to be able to scan the picture with all areas in sharp focus. This has resulted in smaller camera apertures for increased depth of focus and has raised the key lighting levels to as high as 1,000 foot-candles, or higher.



FIG. 5. Another scene from the M-G-M "Diane," photographed by Robert Planck.

The "Brute" (Mole-Richardson Co.) which is the major studio set lighting carbon arc spotlamp, even though filtered for a light loss was still adequate to overcome the lower set lighting levels, but not to do proper painting with light over the higher base lighting levels when the lamp-to-object distance was great.

High Filter Loss Eliminated

A lamp with twice the power input was called for, one that would provide twice the photographic effect of the filtered lamp with white-flame carbons. This increase was obtained by changing the color characteristics of the carbon arc source to meet the sensitivity of the film and thereby eliminate the need of a heavy filter loss, rather than by doubling the power input.

In process projection, where a picture is projected on and through a translucent screen, then photographed from the opposite side where it forms the background for a set, the yellow-flame carbon has been accepted as almost a miracle.

As previously stated, this yellow-flame carbon gives approximately the same amount of visual light as a standard white-flame carbon of similar physical characteristics, but its *color balance* has been changed to match the film sensitivity. Whereas it was necessary to throw away over 40% of the total light with the white-flame carbon by the use of a heavy filter, the yellow-flame carbon does the job with negligible filter loss.

LETTERS TO THE EDITOR

60-Degree Intermittent

To the Editor of IP:

In the February, 1955, issue of IP, page 7, there appeared an article by J. G. Jackson entitled "A 60-Degree Geneva Intermittent Movement" which I find very original and interesting. However, I believe this design of intermittent is rather complex for cinematography projection, *etc.*

I also read the IP comments upon the proposed Jackson intermittent, and I find some mistake in the following paragraph:

> "Then, too, no difficulty would be encountered in adapting these movements to 16-mm applications, it being necessary only to substitute a 4-tooth, 16-mm sprocket for the 35-mm sprocket."

I doubt if one four-frame (4-tooth) 16-mm sprocket may handle the film without tearing it.

A four-tooth, 16-mm sprocket is only about ⅜-inch in diameter. With one 8-frame (8-tooth) sprocket, the Maltese cross or star will be 8 slots, thus a 135-degree pull-down is obtained. A 135-degree pull-down intermittent is not efficient for projection. However, a solution is to employ one or two accelerators to bring the pull-down period about 57-degrees, or use a four-point star geared down to one 8-frame sprocket by means of two constant-velocity ratio gears, 1-to-2.

Design Widely Employed

The first design is widely employed at present on 16-mm projectors, such as Kodak Model 25, Duiker, Hortson, Philips, Leitz and others. The second design is used in the German Bauer Selection projector.

To return to the 60-degree intermittent for 35-mm projectors: in 1920 the Pathescope Co. introduced in America a clever intermittent movement with only a 60-degree pull-down period, the mechanism being known as the "Eccentric Star Intermittent," as described by W. B. Cook in Transaction No. 10 of May, 1920, the *Journal* of Society of Motion Picture Engineers, page 70.

This intermittent was designed with a standard four-point star but with slots milled out of the normal axis of the conventional star. This intermittent had a large cam pin, and the shutter used was the same as that illustrated in the article by Mr. Jackson. It had three equal blades and three equal openings each of 60 degrees, thus the same light delivery onto the screen, but with 72 cycles frequency, hence a truly flickerless shutter.

The writer heard some time ago about a British patent relative to this redesigned intermittent movement hold by E. Moy & Co.

Jose M. Ruiz
Box 82, Santa Clara, L. V., Cuba

Many Thanks, Brother

To the Editor of IP:

I wish to commend you upon the excellence of your publication. It's a wonderful aid to the projectionist and just about the only source of current understandable technical information.

Charles V. Franks
Washington, 7, District of Columbia

Splicing Film Properly

To The Editor of IP:

What is all this stuff about how to "properly" splice film? This chore is a cinch and does not require a long list of procedural "instructions" for the benefit of any projectionist who can put on a good show with today's diverse and sometimes complicated equipment.

All that is needed is the right equipment and a little common sense. The former consists of a good splicer with an even tension on the splice, an even flow of cement after the film is made ready, and last but not least a good fast-action cement.

We are told that the only way to get an even flow of cement on a splice is to use a good cement brush. Yeah? Well, there never was a *good* cement brush nor a good cement bottle.

Sandblocks Available Free

It was stated rceently in I.P. that a little sandblock helps greatly in making the film ready for splicing. The writer agrees, because he was the first to make such blocks and he introduced them into the projection field. I will gladly send such a block *free* to any projectionist, who can see how its done and from there on make his own. Just drop me a card.

Now, as to an even flow of film on the made-ready splice. Drop into any drug store and for about 25 cents obtain a small bottle with a perforated applicator top. It takes a little practice with this applicator to get the knack, but once you do you'll have the best you ever used and with always an even flow of cement on the splice. If you can't get one, send me 25 cents and I'll send one to you.

Give this a try. We who make film cement and are extremely interested in its proper application have proved its worth. You'll find it 100% better than any brush or messy cement bottle ever produced. —R. J. Fisher, Fisher Mfg. Co., 1185 Mt. Read Blvd., Rochester 6, N. Y.

Editor's Comment: It was never any great risk to splice film when due care was exercised. Recent comment in IP and elsewhere is traceable to the introduction of various new processes and, believe it or not, the continuing existence of some nitrate stock not properly identified..

As for DuPont's new Cronar film, still in the experimental state and therefore of no great concern to projectionists at the moment, it must be remembered (and will be emphasized again and again at the proper time) that this stock is not soluble to and therefore does not permit of splicing with present film cement.

DuPont was forced, therefore, to devise a new means for its splicing. Happily, the method devised makes possible the splicing of Cronar not only to itself but to any other film base. This method and the unit employed have been greatly simplified since they were described in IP for March, 1955, p. 7.

Kodak Sales, Net Away Up

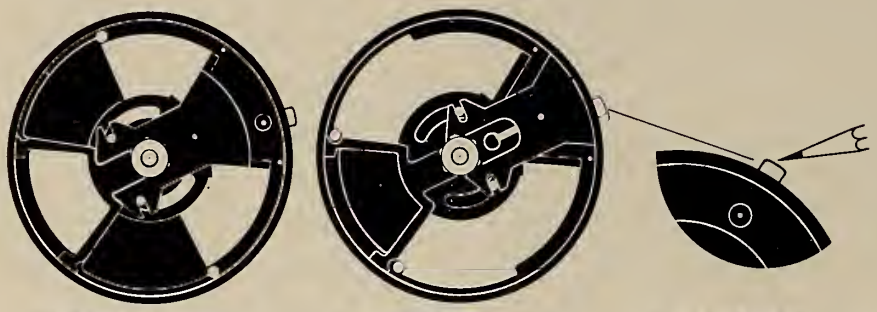
Sales and earnings of Eastman Kodak for the first half of 1955 (24-week period ending June 12) were at the highest levels in the company's history. Consolidated sales of Kodak's units in the U. S. for this period amounted to $315,850,102, an increase of 13.6% over last year's corresponding figure of $278,132,132. Sales also topped by 11% the previous Kodak first-half record of $286,382,170, set in 1953.

Net earnings after taxes amounted to $36,365,989, an increase of 29% over earnings for the first half of 1954, and equal to $1.97 per share on 18,277,260 common shares outstanding, compared with $1.60 a share on 17,401,845 shares outstanding at the close of the 1954 first half. Common shares outstanding were increased following the payment of a 5% stock dividend last March. Earnings were 11.5% of sales compared with 10.1% in the corresponding period in 1954.

Particularly good gains were made by various types of film, including color films, 8-mm amateur film, films for the graphic arts, and professional motion picture films.

YOUR BEST BUY
U. S. SAVINGS BONDS

Double-Gaited 16-mm Shutter by Eastman



Switch on at silent speed
The Super-40 Shutter outomoticolly presents three shutter blodes. With three light interruptions per shutter revolution . . . ond 16 fromes-per-second operoting speed . . . the Pageont develops 48 light interruptions per second. Comfortoble, flicker-free projection with stondord illuminotion.

Switch to sound speed
The Super-40 Shutter shifts outomoticolly to two blodes, ond screen illuminotion is increosed by more thon 40%! Yet ot 24 fromes-per-second sound speed, there ore still 48 light interruptions per second . . . ond your movies, though omozingly brilliont, ore still comfortobly free from flicker.

Or lock in 3-bladed position
For those occosions when you don't need the extro brillionce of o two-bloded shutter — projection in very smoll rooms, for exomple— o speciol latch lets you lock the shutter for stondord illuminotion. And when you wish to return to outomotic control, just releose the locking lever.

A NEW SHUTTER for Kodascope Pageant projectors, which shifts automatically between two- and three-bladed positions, provides increased screen illumination while retaining freedom from flicker during showing of both sound and silent motion pictures, has been developed by Eastman Kodak. Called the "Super-40 Shutter" the new device is regarded as one of the greatest advances ever achieved in 16-mm sound projection.

With the Super-40 Shutter, the Kodascope Pageant becomes the first truly all-purpose machine. Equipped for both sound and silent projection it is capable not only of projection under "normal" conditions, but also for use under difficult conditions of illumination, in hard-to-darken rooms, in large halls, and wherever additional screen brilliance, extra-long projection throws, or unusually large images are required.

Automatic Switching Facility

Operated at 16-frames p.s. silent speed, the Super-40 Shutter presents three blades and provides a flicker-free, 48-light-interruptions-per-second. When the projector is operated at sound speed, the additional centrifugal force produced actuates a mechanism that changes the shutter to two blades. At sound speed, the shutter transmits more than 40% additional illumination, yet still maintains the eye-easy, 48 flicker-free rate.

For those occasions which do not call for the extra brilliance of a two-bladed shutter, a special latch permits the operator to lock the shutter for standard illumination. The Super-40 Shutter returns to automatic operation when the latch is released.

The new device meets the need which projector manufacturers and users have long recognized as essential for additional projector illumination. Greater brilliance has been needed to make possible the larger screen sizes required in modern 16-mm projection. Improved room-darkening techniques have provided a partial solution, as have the incorporation into 16-mm projectors of faster lenses and lamps of greater capacity.

The key to the question of light transmission has *always* been the projector shutter, and it is this problem which the Super-40 Shutter has solved.

Ray Brian — Ace Archivist

PART III of the listings from Ray Brian's (IA Local 434, Peoria Illinois) enormous and detailed collection of projection equipment and information dating back to Edison's "Kinetoscope" of 1889. The Peoria projectionist has gathered a list of over 350 different makes of machines, is aiming for more.

Except for those marked with an asterisk, Ray has photos of every projector listed — 212 photos in all — and would appreciate any additional contributions to his famous lot. Ray may be contacted through IP. The third lineup follows:

CINAGRAPHOSCOPE — mode obout 1900.*
CINCHRO — mode in Englond, 1921.
CINELUX — made in France about 1931.
CINEMATOGRAPHE — Lumiere Bros., Lyons, France, 1896.
CINEMATOLABE — Lumiere and Corpentier, Fronce, 1896.*
CINEMECCANICA — mode in Itoly, 1948.
CINEMAPLAQUE — mode in Italy by Gionni Bettini, 1912.
CINESCOPE — mode by Ernemonn for Cinema Troders Ltd.
CINEMATOSCOPE — Birt Acres, 1896.*
CINOGRAPH — obout 1900.*
CINOMOGRAPH — about 1900.*
CINOSCOPE — obout 1900.*
CLIMAX — . . . *
COMES — o continuous projector using eight lenes, 1928.
COSMOGRAPH — made in Morehead, Ky., by E. E. Moggard, 1920.
COSMONOGRAPH — mode obout 1900.*
COSMOSCOPE — mode before 1900.*
CRITERIOSCOPE — J. B. Colt Co. (Unger and Krug potent), 1897 to 1900.
CRONE — . . . *
CUNOSCOPE — mode before 1900.*
C ond W — Mode in Austrolio by Cummings ond Wilson since 1920.
CYNNAGRAPH — mode before 1900.*
DAFATONE — mode in Isroel.*
DAY — mode by Will Doy in London, 1918.
DE BEDT — mode before 1900.*
DeVRY — Hermon DeVry, since 1914.
DIARAMISCOPE — mode obout 1900.*
DOM MARTIN — made about 1900.*
DRESDEN — mode in Germany, 1954.
DRESSLER — mode by Chorles Dressler, 1908.*
DUPLEX — M. P. Industries, New York City.*
DUPLEX-ACE — S.O.S. Cinemo Supply Co., New York City, 1929.

[TO BE CONTINUED]

SMPTE Color Tv Test Films

Color Tv test films in both 16- and 35-mm film, plus slides, are now available from the Society of Motion Picture and Television Engineers. The prints measure the optimum quality of color material obtainable from Ansco, Technicolor, and Eastman prints. The picture-only films consist of three sections of five scenes each. Beginning with the first scene, a gray scale is included which can be used in set-up for adjusting the signal-generating equipment so that the color sub-carrier vanishes.

The same high-quality color picture material used in the test films is found on the 2-inch square color slides. A black-and-white chart of the alignment and resolution target used in the standard Tv test films is included. Scenes in both slides and films were illuminated for shooting with a lighting ratio of approximately 2/1, *i.e.*, the light "key" was twice the "fill" light, as measured in foot-candles.

Interiors, exteriors and a wide range of colors are included in the scenes, all of which contain one or two persons. Most were medium shots, with an occasional close-up.

The 35-mm color Tv test film, 700 feet long, costs $95; the 16-mm, 280 feet, is $50, while the set of ten slides is $25. Obtainable from SMPTE at 55 West 42nd St., New York City, 36.

Isolate Pure Substance

Chemical which makes cells divide has been isolated in pure crystalline form by University of Wisconsin scientists. The chemical, called kinetin, is obtained from a compound known as DNA or desoxyribonucleic acid, a component of chromosomes. When a trace of the substance is added to culture media for plant tissue cells which are past the growth period, the cells divide and new cells form so long as the chemical is in the medium.

Splices in Negative Showing Through Positive Prints to the Screen

ONE of the outstanding characteristics of modern movies is the *unobtrusiveness* of the projection process. The days of frequent misframes, dirt in the corners of the apertures, and accidental losses of light are definitely past. It is a serious matter, therefore, when the release print itself contains defects which draw the attention of movie audiences from the screenplay to the mechanics of the presentation.

CinemaScope prints unfortunately contain an annoying flaw which audiences find distracting and which projectionists believe to be unnecessary. It is due to the use of standard negative splices which, printed through onto the positive film, show up on the screen at every single change of scene because the CinemaScope apertures are too large to conceal the splice images.

Splice-Line Positioning

As all projectionists know, the large number of individual scenes that make up a finished picture are spliced together in the negative; and when the negative is printed, a faint image of each and every splice prints through. In regular non-anamorphic prints, images of the narrow negative splices occur *inside* of the comparatively wide framelines, and hence are not visible on the screen to mar the picture. Not so in the case of CinemaScope prints, all of which utilize full-height frames separated by very narrow framelines.

Even though negative splices are quite narrow — narrower than the regular positive splices used for repairing prints — they nevertheless overlap into the picture area at the top or bottom of the frame at each splice when the picture is in CinemaScope. To aggravate the situation, the vertical dimension of the CinemaScope projector aperture is so great (0.715 inch) that it includes nearly all of the height of the picture on the film, permitting the printed-through images of the negative splices to flash on the screen.

The negative-splice image is visible as a horizontal white line — thin, but very conspicuous — near the bottom (sometimes the top) of the projected picture at each "cut" or change of scene. The projectionist has practically no leeway at all in framing because the CinemaScope aperture is so large, precluding all possibility of masking the splice images by careful manipulation of the framing knob. The thin white line invariably flashes across the picture at every cut.

Projectionists are expected to notice visual flaws in motion pictures; their job to keep a critical eye on the screen even when engaged in the numerous other essential room tasks. But the visibility of negative splices in CinemaScope pictures, sad to relate, also smacks theatre patrons in the eyes. A moviegoer would have to be nearly blind not to see them.

Suggestions for Improvement

Something must be done about this visual flaw of CinemaScope films. But *what* can be done, *should* be done? A new method of splicing CinemaScope negatives appears to offer the best solution of the problem. Splices that are still narrower — really "hairline" — across the picture area (no matter how wide in the perforation margins) would surely eliminate the annoying splice-image lines in CinemaScope release prints. Another idea involves a hairline paint-over on the splice images on the master positive from which the dupes are made, the theory being that a thin black line isn't as noticeable as a white line. Plastic-tape splicing, similar to that used with Du Pont "Cronar" stock, is another possible way out of the predicament.

However the trick is turned, the removal of negative-splice print-throughs on CinemaScope positives demands the most serious attention on the part of studio technicians. The accomplishment of this particular job is an end which would seem to justify almost any means.

Old-Time Movies Restored by a Novel Process

OLD-TIME MOVIES on rolls of paper, like so many adding machine tapes, today are providing Hollywood its first real link to the very beginnings of motion pictures

The paper-film prints of early-day flickers have been resting — and deteriorating — in the vaults of the Library of Congress at Washington, DC., ever since they were first filed there for purposes of copyright. Until 1912 that was the only legal way to copyright a movie — by filing a print of it on paper.

These "still photos" of pictures that moved are about two inches wide — it varies a little — and anywhere from three to 3000 feet long, and many of them are without sprocket holes, for it wasn't meant that they were to be projected. Fact is, most of them never had been projected. The first successful screen projector didn't come along until about 1905; before that movies could only be viewed in "peep show" fashion.

'Misshapen Paper Positives'

The paper positive prints — for that's what they are — were filed away in tight rolls which often shrank together into tight, misshapen masses on which the picture images were faded, if they could be discerned at all.

But they are invaluable, for they are all that remain of most early-day motion pictures. They represent the beginnings of movement in photography. All of the original negatives have become lost, and what later dupe negatives there were hav long since crumbled to powder.

So it is from the treasure trove of paper "films" now that a whole new set of celluloid negatives is being made through a joint project of the Academy

MOTION PICTURE FILM & FQUIPMENT EXPORTS IN 1954

Here are the figures, as compiled by the Motion Picture Division of the U. S. Dept. of Commerce, relating to the export of motion picture equipment, visual and aural combined, for the year 1954.

	JANUARY-MARCH 1954		JANUARY-MARCH 1955	
CAMERAS:	*Number*	*Dollars*	*Number*	*Dollars*
35-mm	39	83,367	59	207,638
16-mm	1,251	141,903	1,129	156,379
8-mm	6,405	190,201	8,543	254,299
TOTAL	7,695	415,471	9,731	618,316
PROJECTORS:				
35-mm	373	203,957	342	164,756
16-mm Silent	440	53,408	1,077	72,199
16-mm Sound	2,091	648,232	1,954	623,207
8-mm	2,533	113,622	4,777	233,249
TOTAL	5,437	1,019,219	8,150	1,093,411
OTHER EQUIPMENT:				
Sound Recording	—	133,278	—	149,561
Sound Reproducing	—	501,276	—	668,025
Arclamps	207	87,496	581	112,940
Screens	—	516,009	—	265,403
N.E.C. & Parts	—	524,090	—	524,000
Studio Units	—	282,252	—	432,966
TOTAL		$2,044,401		$2,152,895

of Motion Picture Arts and Sciences and of the Library of Congress, financed by the Academy.

The tedious copying job onto new negatives, frame by frame from the faded prints, is being done with equipment especially designed for the purpose, at a small laboratory in Hollywood known as Primrose Productions, Kemp Niver, manager. After two years of laborious effort, he and his small staff have duplicated 70,000 feet of film, involving 334 titles. They have nearly 2,000,000 feet to go before they are done, involving several thousand titles, many of them not yet identified.

Niver devised his method after various laboratories and technicians had tried to reproduce the paper images with conventional film printing equipment and found it impractical. Trained as a lawyer and formerly a private investigator, but wholly unschooled as a film technician, he solved the problem by applying the thinking and methods of an investigator until he found a way that did work. And then built a machine like none other with which to do it.

He has already recreated what is believed the first movie to be copyrighted in this country — a tiny piece of film entitled "The Sneeze," for the action it depicted. Dating back to 1889, and copyrighted in 1892, it consists of exactly 45 frames, original running time one second, but stretched now to 15. More impressive that way.

Nothing New Under Sun

One of the most exciting of his reproductions is the very first, circa 1898, production of Jules Verne's "Twenty Thousand Leagues Under the Sea," made in France by George Melies in collaboration with the author Verne himself. It runs seven minutes and its footage includes such supposedly much later technical tricks as lap-dissolves, animation mixed with live action, underwater photography, pan and dolly shots.

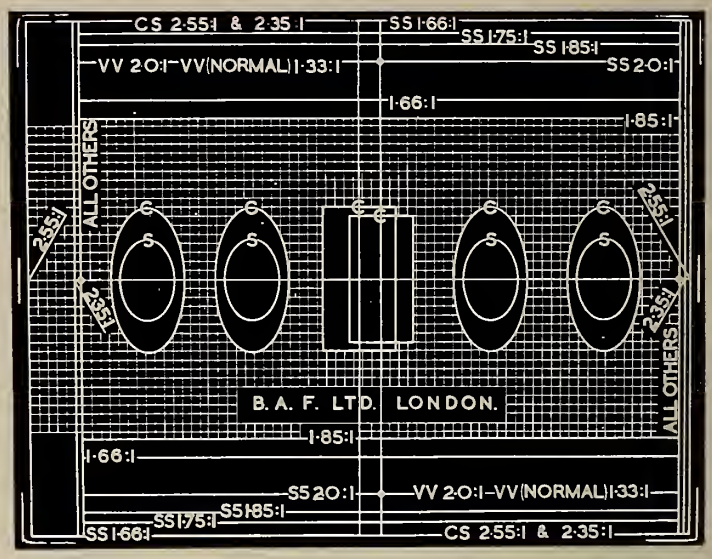
To do all this, Niver and his staff first have to soak the paper rolls in a chemical bath and water, and then carefully unroll them a few inches at a time. In the case of early celluloid negatives from whatever sources, the film must first be painstakingly patched with clear plastic before any copy can be made.

And since the early silent films were photographed at different camera speeds than now prevail, Niver has to compensate for that, too, in order to project the pictures through modern machines. In doing so, he has somehow eliminated the flicker that characterized the early silents, and at the same time improved the picture quality. The pictures as he reproduces them are better than their makers ever imagined they could be.

Niver is aware of the psychological hazard in eliminating the flicker, for flicker lends a persuasive nostalgic touch to old movies. But he is convinced that progress — even in pictures older than a half-century—is both inevitable and commendable. So out goes the flicker, and posterity may make what it wishes of the omission.

[NOTE: The foregoing is a condensation from AMERICAN CINEMATOGRAPHER for July, 1955, p. 392.]

Inclusive Test Film by British Acoustic Films



Representation of the alignment test target film available from British Acoustic, inclusive for all projection conditions.

FILM workers in England and in member countries of the British Commonwealth (wherein IP has substantial circulation) will be interested in a new test target film covering most types of projection systems in use today which has been made available by British Acoustic Films, 37-41 Mortimer St., London, W. 1, England.

Outlines are provided which indicate the positions and dimensions of *both* types of CinemaScope apertures: that which corresponds with the aperture used on film with magnetic tracks is marked 2.55:1; that for the aperture used on film with a photographic sound track is marked 2.35:1. These figures, of course, correspond with the aspect ratio of the projected picture.

Target Line Identification

The target contains two vertical centre lines, one corresponding with each of these two CinemaScope apertures. It also contains two rectangles centered on these centre lines, and four elipses marked with the letter "C". These four elipses and the two rectangles are so proportioned that they would appear as circles and squares, respectively, when correctly projected with an anamorphic expansion ratio of 2:1.

In addition, the target contains top and bottom frame limits as used in the Superscope system, which, when projected with an anamorphic lens having an expansion ratio of 1½:1, give projected picture aspect ratios of 1.66:1, 1.75:1, 1.85:1 and 2:1. These lines are designated by the letters "SS" in front of the figures, denoting the projected picture aspect ratio. Four elipses marked with the letter "S" are also provided; these will appear as circles when projected with an anamorphic expansion ratio of 1½:1.

Inclusive Single Section

The target also contains the outlines of the old standard aperture, giving a projected picture aspect ratio of 1.33:1. These lines, of course, coincide with the Superscope 2:1 and the proposed Vista-Vision 2:1 apertures, because both these latter systems use an anamorphic expansion ratio of 1½:1. Also shown are aperture limits for 1.66:1 and 1.85:1 picture aspect ratios as obtained by masking down standard prints.

The background of small squares is provided to enable uniformity of focus over most of the screen area to be checked. White markings on a black background have been chosen because this type of picture is much less tiring to look at than one which contains black-on-white markings.

The film is normally supplied in 200-foot lengths.

Film Theatres' 1 1/3 Billion in '54

Motion picture theatre box-office collections totalled $1⅓ billion in 1954 as compared with $1¼ billion in 1953. In 1954 the film industry accounted for $964,000,000 of national income, topping the 1953 mark of $839,000,000. The industry also surpassed its 1953 figure in salaries payed with $709,000,000 in 1954 as against $678,000,000 in 1953.

In 1954 the film industry had 206,000 "full-time equivalent" employees, compared with 209,000 and 216,000 in the preceding two years. Industry workers' earnings averaged $3,442 annually in 1954, compared with $3,244 in 1953. Those engaged in film industry production totalled 217,000 in 1954, compared with 220,000 in 1953.

What Do You Know About Carbons?

The third of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data provided by National Carbon Company.

Define 'Incident Lumens'?

Screen light is frequently expressed in "*incident lumens*" which is a measure of the total useful light output of the carbon arc lamp and projector mechanism. To measure the screen lumens in any particular case, the screen may be divided into small areas of substantially uniform illumination, and the magnitude of the illumination in foot-candles measured in each such area.

The foot-candle values thus obtained, multiplied by the associated area in square feet gives the total lumens for that area; and the summation of these lumen values for all the areas gives the total screen lumens. Light measuring devices calibrated to read directly in foot-candles are available for making such measurements.

How Does One Determine 'Average Illumination'?

If the total lumen output is given for a particular projection system the *average illumination* in foot-candles for any given size screen may be obtained by dividing the total available lumens by the area of the screen in square feet.

For example, if a projection system delivers 3,600 lumens to a screen 300 square feet in area the average light intensity on the screen will be 3,600 divided by 300 or 12 foot-candles which is equivalent to 12 lumens per square foot. In all practical cases, however, the light is not distributed uniformly over the screen area in this fashion; the light intensity at the sides of the screen is usually 60% to 80% of that at the center.

Why the Term 'Screen Light Distribution'?

The term "*screen light distribution*" is used to express the degree of uniformity of screen illumination. Ordinarily this term is simply the ratio of the illumination near the edge of the screen, on a horizontal center line, to the illumination at the center. A "*screen light distribution of 80%*", frequently more precisely expressed as "*the side to center distribution ratio*", simply means that the side illumination is 80% of that in the center.

If such measurements are to be reliable, care must be taken to align the lamp optical system properly and to hold the arc crater precisely on the



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Northampton, Massachusetts

New York Office: 30 Church Street, New York 7, N. Y.

desired operating point so that the screen will be symmetrically illuminated at optimum value.

'Brightness' and 'Foot-Lamberts'

The amount of reflected light depends upon the original character of the screen surface as well as its age and conditions of cleanliness. In the case of the motion picture screen, the term "*brightness*" refers to the light per unit area reflected from the screen. The "*foot-lambert*" is the unit of "*brightness*" ordinarily used to define the amount of light per unit area reflected from the screen.

A perfectly diffusing surface reflecting light at the rate of *one lumen per square foot* is said to have a *brightness of one foot-lambert*, and it appears equally bright from all angles of view.

Does Screen 'Brightness' Vary?

The *brightness* of a screen which is not perfectly diffusing will generally vary with different angles of view. Some screens with directional properties (such as silver screens and beaded screens) concentrate the reflected light in one direction and may, therefore, appear much brighter in this direction than a perfectly diffusing surface reflecting the same total amount of light.

Explain 'Apparent Reflectivity'

The *apparent reflectivity* of a screen in any given direction is defined as the ratio of the brightness in foot-lamberts to the incident intensity in foot-candles. For diffusing type (flat white) screens the apparent reflectivity is approximately constant over a wide angle of view and generally does not exceed 75% to 90%.

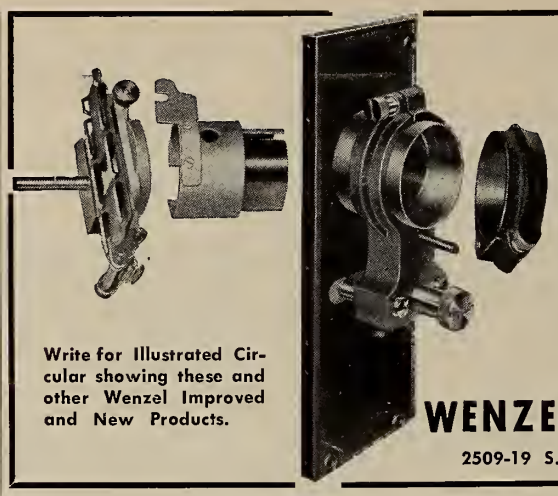
Dirt and age may, in extreme cases, reduce these values by as much as one half. A directional screen may have an apparent reflectivity of 200% or 300% in a selected direction and fall much below 100% in other directions.

This *apparent reflectivity* must not be confused with the total or *overall reflectivity* of the screen which measures the ratio of the total light reflected in all directions to that incident on the screen and which will always be less than 100%. Information on the reflecting power of any given screen *in its original condition* can be obtained from the screen manufacturer.

In the example cited previously the method of calculating the average intensity of the light delivered to the screen was shown and an average value of 12 foot-candles, or 12 lumens per square foot was obtained. Let us assume that this is a perfectly diffusing screen with a reflecting power of 75%. This means that 75% of the light delivered to the screen is reflected and that 25% of this incident light is absorbed by the screen.

Therefore the quantity of light reflected by this screen or its "brightness" will be 75% of the incident light (75% of 12 lumens per square foot) or 9 lumens per square foot which by definition is equivalent to 9-foot-lamberts.

[TO BE CONTINUED]



Write for Illustrated Circular showing these and other Wenzel Improved and New Products.

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B&L 16-mm C'Scope Lens

A 16-mm CinemaScope projection lens system that will adapt to all popular 16-mm projectors was announced today, July 30, 1955, by Bausch & Lomb, Rochester, N Y. It is a combination prime and anamorphic single-barrel lens, listing at $124.50 with an adapter, available in 2-inch focal length. Other focal lengths will be made available, if demand warrants. When used at the same throw distance as a regular lens, the lens will produce an image twice as wide.

Earlier Errors Corrected

B & L has designed its lens to include a prime lens system so as to avoid the danger of imperfect projection that could easily develop through *standard* 16-mm lenses, because the latter were not designed for the increased horizontal magnification. The B & L CinemaScope lens requires no brackets or supports, is 6⅞" long and weighs only 7¾ ounces.



Bausch & Lomb's new CinemaScope 16-mm projection lens, with proper adapters, will fit any existing 16-mm projector.

The new lens will make it possible for thousands of small theatres around the world, industry, institutions, clubs, and military installations to project any standard CinemaScope prints, which it is understood will soon be available through the usual channels. Further details from B&L, Rochester, N. Y.

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MIDWEST: Raytone Screen Corp., 401 West St. Charles Rd., Lombard, Ill.

864 Theatres in N. Y. Area

Theatres situated in the New York City metropolitan territory total 864, including 821 conventional houses and 43 drive-ins, according to a recent count. The metropolitan territory includes New York City, Long Island, New York State south of Kingston, and New Jersey north of Trenton.

New York City's five boroughs have 436 theatres and two drive-ins. Location of the theatres can be broken down as follows: Manhattan, 160; Brooklyn, 146; Bronx, 68; Queens, 79, and Staten Island, 10.

Theatres in Long Island, outside of Queens total 72, plus eight drive-ins, while there are 93 theatres and 14 drive-ins in the southern part of New York State, Northern New Jersey has 220 theatres and 19 drive-ins.

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Hi-Fi Show in New York

The largest assembly of high-fidelity enthusiasts ever to gather for a single event are expected to attend the 1955 Audio Fair, to be held for four days beginning October 14 at the Hotel New Yorker, New York City. A development of the last few years, the Fair is of interest to music lovers, hi-fi hobbyists and professional audio engineers. Interest in high-quality sound reproduction in the home has zoomed.

Britain Box-Office Down

A decline of more than $1 million in gross box office receipts in Great Britain for the first quarter this year compared with a similar period in 1954, was reflected in the latest returns. A mark of $76,272,000 was recorded for gross takings, contrasted with $77,726,000 in 1954.

Ed Seeley to Hollywood

ED SEELEY, chief engineer of Altec Service Corp. at New York headquarters since 1946, has assumed his new duties as director of engineering for the parent outfit, Altec Lansing Corp. in Beverly Hills, Calif.

Seeley, widely regarded as an outstanding electronic engineer in the aural-visual field, began his career as a field serviceman with the old ERPI company in 1929. When Altec was formed in 1937 he was named development engineer. During World War II, at the request of the National Defense Research Council he was assigned to several important projects at Bell Telephone Labs.

Major Industry Credits

A graduate of Cornell University engineering school, Seeley is credited with major contributions to the solution of problems attendant upon the recording and reproduction of magnetic sound. He is secretary of the Society of Motion Picture & Television Engineers.

Ed is remembered fondly as a fine engineer and an all-around good fellow by the hundreds of projectionists who were fortunate enough to enjoy direct contact with him.



Ed Seeley is named chief engineer for Altec Lansing Corp.

Republic Pictures Profits Rise

Republic Pictures reports a net profit of $804,202 for the fiscal year ended October 31 last, compared with a net of $497,217 for the previous year. Republic is increasing substantially its Tv film activities, with arrangements to release Gene Autry and Roy Rogers pictures to Tv concluded.

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On The Right Flank, On The Left Flank—and Surrounded

For all who read as they run, we direct attention to the appended pronouncement by Barney Balaban, president of Paramount Pictures Corp. We hope that those who read these lines will recall that Mr. Balaban's present eminent position in the motion picture industry was attained via the exhibition field—that is, the operation of a multiplicity of theatres which employed doormen, cashiers, ushers, cleaning women, stagehands, and projectionists—wage-earners all.

Mr. Balaban in his official capacity is still actively engaged in the pursuit of the theatre exhibitor dollar by reason of the distribution of Paramount Pictures at rental rates which might occasion astonishment in a more well-ordered industry.

Here are excerpts from Mr. Balaban's effusion:

"The pious declarations of David Sarnoff, chairman of the Board of National Broadcasting Co., who attacked 'Pay-As-You-See' television and the interest of motion picture companies in Toll-Tv is absurd. He attempted to defend the vested interest of the big networks in maintaining the present system of so-called 'free Tv' . . . There is less freedom in the Tv market-place because of its present dominance by the giant networks than in any form of entertainment distribution. . . .

"It is a few executives of the networks and a handful of sponsors (can you hold 350 sponsors in one hand?) who determine what the public shall see . . . It's the sale of merchandise rather than the inherent value of the program that sets present Tv standards.

"One gets tired of these pious declarations about the motion picture companies in their relation to television . . . Anyone can make a motion picture who has the talent and money to do so. There is nothing to prevent NBC from investing in quality production motion pictures as we do in our business.

"Why doesn't Mr. Sarnoff lead the parade? The answer is simple: sponsors cannot afford to pay for a million-dollar production and then *give* it away."

We leave it to the judgment of the thousands of projectionists and stagehands who have labored assiduously through the years to make it possible for Mr. Balaban to rise to the presidency of Paramount Pictures Corp. to render their own judgment upon the foregoing.

Century C and CC Heads in Improved Versions

Century Projector Corp. announces that an improved version of the well-known Models C and CC projector mechanisms are now being manufactured in quantity and are available for shipment throughout the world.

Among the improvements are an enlarged observation window for easier viewing of the film as it passes through the projector, a new design of water-cooled aperture (non-condensing) that can be easily changed to accommodate all standard and special film sizes, whether VistaVision, CinemaScope, Superscope, etc., and newly designed light shields to accommodate the latest high-light-output arclamps.

The mechanism can use 4-inch diameter high-speed lenses and, with adapters, can be used for all standard lenses including those for C'Scope. The lens mount now makes it possible for the projectionists to easily focus the more critical short-focus, high-speed lenses. Also incorporated is a newly developed lubricant which will not "creep" or change viscosity within a temperature range from freezing to boiling, insuring uniform focusing at all times and under all conditions.



Exterior view of Century Models C and CC projector mechanisms.

The main drive shaft is designed so that the soundhead coupling is directly mounted to the shaft. eliminating the usual 17-tooth pinion and stud unit, resulting in a positive trouble-free drive arrangement between mechanism and soundhead.

Simplex Drive-in Speaker Highly Shock-Resistant

The new Simplex drive-in speaker. now being marketed by National Theatre Supply, contains a number of design refinememnts to make it more resistant to rought treatment and easier for the theatre patron to use.

The unit includes a 4-inch Alnico-V aluminumm voice coil speaker, springmomunted into the two halves of the die-cast aluminum housing. This mounting method assures a floating suspension which reduces shock, minimizes magnet shifting and simplifies replacement.

The housing is finished in a durable silver hammertone enamel baked over a zinc chromate base, and has a two-step window bracket to aid in positioning. The handle is an oval-shaped plastic tube, providing space inside for a phorescent theatre name or slogan card which glows in the dark. The speaker is said to be weatherproof, and contains tamper-proof Phillips head screws throughout.

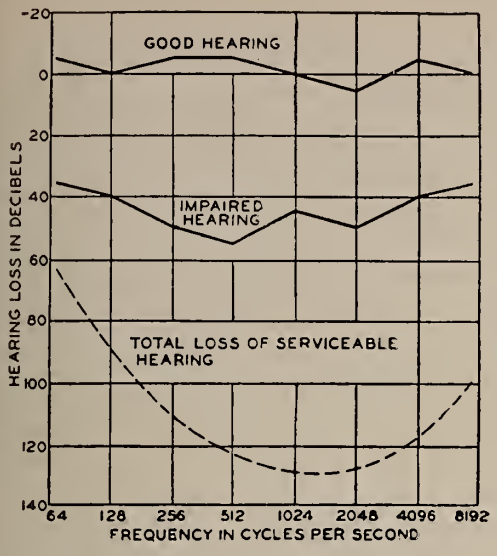
Ampex Stereo Sound

A new stereophonic theatre sound system designed to "make show failure almost impossible" has been developed by the Ampex Corp., Redwood City, Calif. The system, known as the Master Series, is priced at $3.995 for the complete package. Distribution is through the Circuit Construction Corp., and all installations are handled by the Altec Service Corp.

Some 200 Ampex sound installations are now in theatres throughout the country, according to Harrison Johnston, Ampex sales manager. These are in the 30, 60, 80 or 100 watt classifications. The new Master Series, in the 30 watt class, follows the higher priced De Luxe series and Super series.

Primarily a three-channel system, the Master series may be changed to four channels by using the theatre's existing optical system.

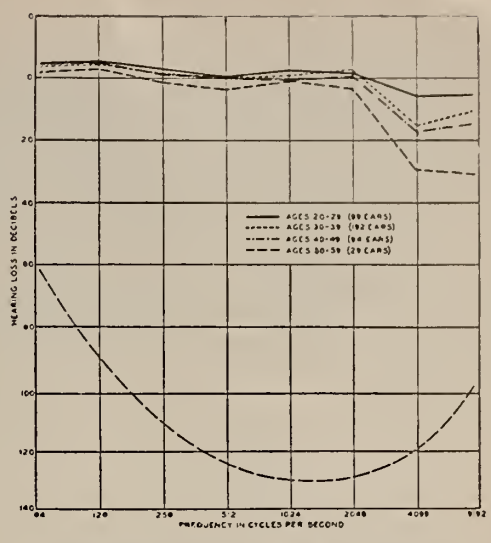
The new 30 watt series equipment includes two penthouse magnetic reproducers, each equipped with four channels in the head, thre for sound and one for the signal.



Graphical representation of the difference between normal and hard-af-hearing ears.

Just in Case Somebody Ups and Asks You

As everybody with a modicum of technical knowledge knows, increasing age in a human has the effect of gradually decreasing his aural and visual perception. Still, we are assailed on all sides by the shrill cry (thank God for old age) that this, that and the other system of production and reproduction will carry us beyond our physical limitations and visit upon us the pure joy of "natural" auditory sensation. Take a look at the accompanying graphs and decide for yourself.



Investigation showed that with advancing age little impairment af hearing narmally takes place except at the higher frequencies.

Todd-AO Bows in N. Y. Oct. 1?

Chalk up still another postponement for "Oklahoma!", first of the Todd-AO so-called spectaculars. October 1 next is now the *tentative* date for the premiere at New York's Rivoli Theatre which, it is said, will feature a new development in a screen 65 feet wide by 25 feet high and with a curved depth of 13 feet, approximating Cinerama dimensions.

With the cost of remodeling the Rivoli — loge seats removed and well covered over — estimated at $300,000, it appears that these new processes are good for the construction trades, if not for the movie exhibition field.

AB-PT Projected Earnings

American Broadcasting - Paramount Theaters expects to earn about $2 per common share in 1955, with Tv operations contributing a fourth of this. The nature of Tv operations, with a relatively high proportion of fixed charges, is such that after the break-even point, a large proportion of additional revenue is carried through to net. AB-PT reached the break-even point last year, with Tv earnings in the first half of this year at 77 cents per share, as against 37 cents last year.

Technicolor Group Insurance

Dividends amounting to more than 10 weeks' premiums were received by employes participating in Technicolor Corp.'s group insurance plan. The Metropolitan Life Insurance Co. paid this dividend despite the fact that $201,237 have been paid out in benefits over the year ending May 2. Amount will be divided between company and employes in same ratio as they share premium payments.

Chicago Amusement Tax Up

Chicago's 3% amusement tax collections totalled $940,771 in the first half of this year. This includes $577,206 derived from theaters. In the first six months of last year collections were $912,169, with $573,314 coming from theaters.

Closed-Circuit N.D. Games

Three Notre Dame football games will be televised to Sheraton Hotel ballrooms in 12 cities via a closed-circuit this Fall. Admission will be $4 for the video games between Miami, Navy and Iowa. Sheraton will not share in the returns, the $4 tab going toward the cost of producing the telecasts.

RKO Theaters' First Half Net

Net income of RKO Theaters for the 26 weeks ended July 2 was $599,757 compared with $904,025 last year. Net income in the second quarter of 1955 was $269,521 before deduction of special non-recurring loss items, which reduced net income to $64,521 as compared with $418,666 in the second 1954 quarter when there were no special recurring loss items.

New Jersey Clearance Howl

The Allied Theater Owners of New Jersey are seeking quick action on clearance of pictures playing in New York. The urgency stems from the fact that subsequent runs in northern New Jersey have to wait as long as five months after the opening of a picture in New York before they can get a crack at it.

This yowling has persisted for many years, all to no avail.

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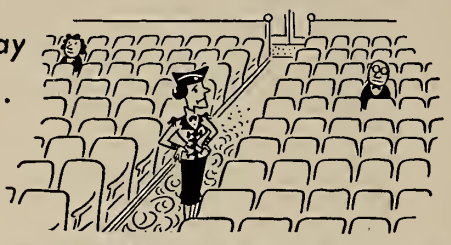
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Modern Science Notes

An Army development is a radiation detector, about as big as a king-size cigaret package, which can be produced cheaply for soldiers and civilians. The device can measure accurately the amount of radiation an individual has absorbed in the wake of a nuclear explosion. This latest atomic age defense device is called a "tactical radiation dosimeter."

• • •

Accurate measurements of audio-frequency current and voltage can be made easily and rapidly with two newly-devised instruments, says the National Bureau of Standards. One, a volt-ampere converter, provides 0.5% accuracy for laboratory use with a D.C. potentiometer. The second, a thermocouple volt-ammeter, is a portable, direct-reading device with an accuracy of one-half of 1%.

• • •

Electric sleuth that detects and counts germs, dust, and other airborne particles too tiny to see has been developed by Armour Research Foundation under sponsorship of the Army Chemical Corps. An elaborate instrument, the aerosoloscope can measure particles as small as 40-millionths of an inch long, and is 1,000 times faster than the usual microscopic examination. The Army announcement suggested potential uses in public health work and industry to trace sources of smog and other air pollution.

The Washington, D. C., district office of Ampex Corp., has moved to 8033 13th St., Silver Spring, Maryland. The company manufactures magnetic tape recorders.

• • •

The Society of Motion Picture and Television Engineers recorded 600 new memberships during the first half of this year.

DAMAGE TO PRINTS

(Continued from page 16)

speed motors, this test cannot be conducted by most projectionists.

Specifically, overall gate tension should range between 6 and 18 ounces for the average projector and with the tension equalized on both margins of the film. "Green" prints run best, and with minimum damage to the perforations if sticking occurs, at 6 or 8 ounces. Average prints require average gate tension, that is, about 12 ounces. Old, well-seasoned prints may need as much as 16 or 18 ounces for steady projection.

Testing Gate Tension

Gate tension may be tested by means of a short length of clean film and a small tubular spring scale having a hook to which the weight (in this case the strip of film) is attached. A hole is punched near the top end of the film so that the strip may be pulled up through the closed gate by means of the scale. The reading of the scale as the film is being pulled upward indicates the tension.

It is very diffcult to make radical changes in the gate tension of the older projectors, as the leaf-type springs have to be bent with the fingers. Many of the more modern projectors, however, are provided with tension adjustments which permit the projectionist to change the gate tension even while a picure is being shown.

Even a cursory examination of the sprocket holes of old, wornout theatre-release prints shows that gate tension is set much too high in the average theatre projector Too much tension results in characteristic cracks at the corners of the perforations. Excessive gate tension also increases the rate of

Billion for Broadcasters

The broadcasting industry will achieve its first billion-dollar gross-income year in 1955, according to an announcement by the National Association of Radio and Television Broadcasters. Tv is expected to gross over $600,000,000, with radio running very close to it.

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for CinemaScope

wear of the intermittent-sprocket teeth; and hooked teeth, in turn, chip and tear the pull-down edges of the perforations.

It is essential that the tension *be the same at both sides of the gate.* The pads which hold the film at the aperture should have somewhat greater pressure than the higher set of pads.

Adjusting the Guide Roller

Incorrect lateral adjustment of the flanged guide roller at the top of the gate may indirectly damage the film perforations. The purpose of this roller is to edge-guide the film as it passes down into the gate. A change in the position of the guide roller produces a corresponding lateral shift of the film in the gate and on the face of the intermittent sprocket.

The sprocket teeth, however, limit the amount of lateral shift possible on the sprocket. If the guide roller is shifted too far to one side therefore, the sides of the perforations bring up against the ends of the sprocket teeth, and the film assumes a slightly *slant-wise* course in the film gate. The result is that the sprocket teeth engage the perforations on only *one* side of the film. Excessive wear of the perforations on this side of the film ensues, and if this undesirable condition is not corrected, the teeth on one flange of the sprocket wear more than those on the other flange.

The flanged guide roller must revolve freely. If the film fails to turn it, the shaft and pivots may be clogged with dirt, the pivots may be too tight, or the tension of the coil spring too great. The tension of this spring is critical.

Guide Roller Flanges

If the movable (inner) flange presses against the edge of the film too strongly, the film will tend to crimp as it enters the gate, with resulting sidewise unsteadiness of the projected picture. Only very little tension is needed for proper film-guiding. A spring that pushes the flange against the film too tightly may be weakened by cutting off and discarding a few turns from the coil.

The flanges of guide rollers which fail to revolve become grooved by the film. Grooved flanges roughen the edges of the film and tend to tear the corners of splices. Weak splices may come apart when they encounter a defective guide roller.

Valuable footage may be destroyed if a film break occurs anywhere in the projector or soundhead. Film may wind up on a sprocket or pile up in the machine. Breaks in the older types of soundhead often result in "pleating," a folding up of the film in the manner of an accordion bellows.

All multilated footage should be removed from the machine and thrown away. If a great deal of film has been lost, the exchange would appreciate being advised of the reel number and footage numbers printed in the perforation margin of the damaged film. It is also a good idea to explain the circumstances of the film break.

Film breaks, we repeat, are avoided by adequate film inspection and painstaking projector maintenance.

Reel-End Alarm Riders

Last but not least the projectionist must consider his reel-end alarm riders as possible causes of scratched film. This type of signalling device usually employs a small roller which rides on the emulsion side of the reel of film in the upper magazine. If the roller does not turn freely, or if it has become burred or damaged, it may inflict a series of lengthwise scratches on the picture area of the film.

It is only fair to state, however, that an examination of the reel-end alarm devices in a large number of theatres indicates that they seldom cause any injury to prints.

[END OF SERIES]



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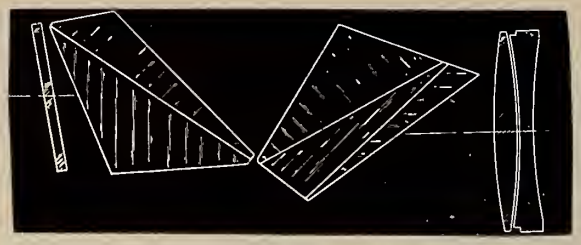


FIGURE 7

Arrangement of prismatic projection attachment.

ANAMORPHOTIC SYSTEMS

(Continued from page 12)

ment. The complete arrangement is shown in Fig. 7.

Some variable prismatic attachments being made in other parts of the world do not include supplementary focusing lenses. The errors of focusing which result are only dependent on the ratio of the two focal lengths and, thus, the expansion ratio. The actual form adopted for the prismatic components can have no influence on this effect.

Requisites for Focusing

To illustrate the necessity of providing suitable focusing means, an image was projected through a variable attachment correctly focused for a given screen distance. The equal definition on vertical and horizontal lines was noted, and it was also observed that *both* horizontal and vertical lines went in and out of focus simultaneously.

Then an image was projected through an identical system whose supplementary focusing arrangement had been removed. It was seen to be impossible to achieve *simultaneous* focus for vertical and horizontal lines, and that the errors increased with *increased expansion ratio.*

The demonstration clearly proved that while the focusing arrangement does add to the cost of the equipment and results in greater weight and slightly increased absorption of light, it is necessary if an adequate standard of definition is to be obtained.

In view of certain misconceptions which have arisen in the industry, it is important to stress that a variable anamorphotic lens should only be used to restore the *particular compression* incorporated in the release print being projected. A change in aspect ratio of the screen picture can only be obtained by masking in the gate aperture of the projector. The size of an object appearing on the screen is governed solely by the focal length of the projection lens selected. Only *one* expansion ratio restores the geometry of picture detail, and an acceptable picture cannot be obtained when the aspect ratio of the picture is altered *solely* by means of the anamorphotic expansion ratio.

It was stated previously that anamorphotic projection permitted the use of larger projector gate apertures and resulted in improved definition and illumination. The improvement in definition exists at *all* expansion ratios, but the gain in screen illumination is most apparent at large expansion ratios such as the factor 2 used for CinemaScope.

Light-absorption Losses

In comparing the illumination on the same screen area provided—first, by normal projection from a cropped gate, and second, anamorphotic projection from a maximum area gate—allowance has to be made for the extra light losses by absorption and reflection within the attachment. It is useful to know where the illumination provided by the two methods is equal.

Assuming that the maximum gate width is constant, the amount of light passing through the gate will be proportional to its height and thus inversely proportional to its ratio.

If the gate for anamorphotic projection has maximum height, its aspect ratio will be about 1.25 to 1. Prismatic attachments transmit about 7/10ths of the available light, so that the two methods give equal illumination at screen aspect ratios of 1.25 divided by 0.7, or about 1.8 to 1. Above this ratio anamorphotic projection gives brighter screens.

B & K Profits Rise

Earnings of the Balaban & Katz theatre chain (Chicago) increased to $1,204,065 for the year 1954, compared with $832,892 in the previous year. The circuit has plans for expansion, including the building of drive-in theatres, once it has satisfied the requirements of the Federal Court divestiture decision, which requires B & K to sell five more theatres.

Tiny storage batteries, less than one-half cubic inch in size, that produce electricity from the rays of atomic bomb by-products, are being tested by the Army and Air Force. Researchers predicted the batteries may be especially useful in electronic equipment using transistors. Core of the battery was said to be strontium 90, a metallic element which, when purified by a chemical process, has a high degree of capacitance similar to calcium but harder.

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When Crook died, Indians wept. And a Sioux chief named Red Cloud said: "He never lied to us. His words gave the people hope."

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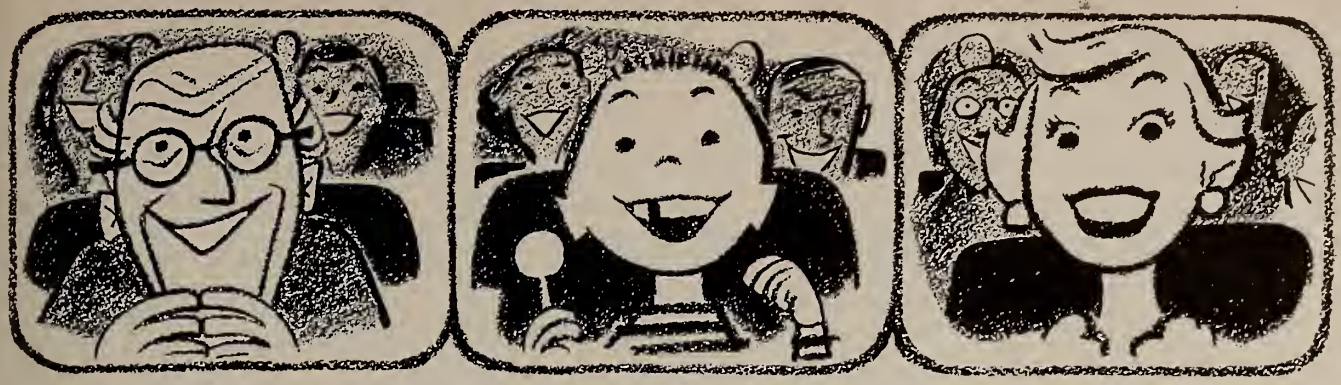
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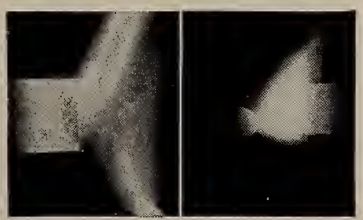
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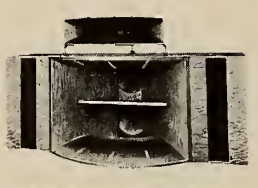
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INTERNATIONAL PROJECTIONIST

R. A. ENTRACHT, *Managing Editor*

JAMES MORRIS, *Associate Editor*

Volume 30 SEPTEMBER 1955 Number 9

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9E

Monthly Chat

Lively TESMA Forum Planned

THE LARGE group of projectionists planning to attend the coming TESMA Convention in Chicago probably have a treat in store for them. Last year, the widely publicized new processes forum turned out to be almost the opposite of an open meeting. The long program of technical papers, read by engineers and others, almost suffocated the forum and left practically no time for questions from the floor or discussion of immediate technical problems. This year things will be different. Merlin Lewis, executive secretary of TESMA, tells us that it has been decided to restrict the number of papers as far as possible, and to concentrate on seeing that the forum remains a forum. Instead of reading papers, the battery of experts from the projector and sound manufacturing plants and Hollywood studios will devote their time to answering questions from the floor. So get ready men!

A Look Into the Future

A PREDICTION that from now on there will be a "double standard" for projection equipment in motion picture theatres was made recently by R. Edward Warn, a vice-president of the Westrex Corp. Within a short time, he thinks, the industry will have come to accept the existence of two distinct types of theatres. One type will be the small number of roadshow or de luxe houses which will specialize in elaborate pictures processed on 70-mm or horizontal-running film for unusual projection effects on giant screens. This type of theatre will, of course, form only a tiny percentage of the total number. The other type will include the great majority and will continue to find its needs amply satisfied by standard-width film and 35-mm projection equipment of high quality.

It is felt by Mr. Warn that utilization of new projection and sound developments by the de luxe houses will permit continuing experiment and pave the way for additional technical progress, which will eventually be passed along to the smaller theatres. In any case, the double technical standard for projection technique will forever end the short-sighted freeze on progress that penny-wise executives imposed on the motion picture industry. This freeze was in effect from the time of the introduction of sound back in the late Twenties until exhibitors were forced to accept the recent changes required by the new processes.

Drive-In Screen-Brightness Survey

WE ARE glad to hear that the SMPTE has completed a preliminary survey of screen-brightness levels at drive-ins with a view toward eventually recommending permanent standards similar to those existing for indoor theatres. Until recently the drive-in was a sort of technological stepchild with many screens too dim to be worth watching. The report by the SMPTE will be published shortly in IP. In it the Society pays tribute to the various projectionists who assisted by supplying information.

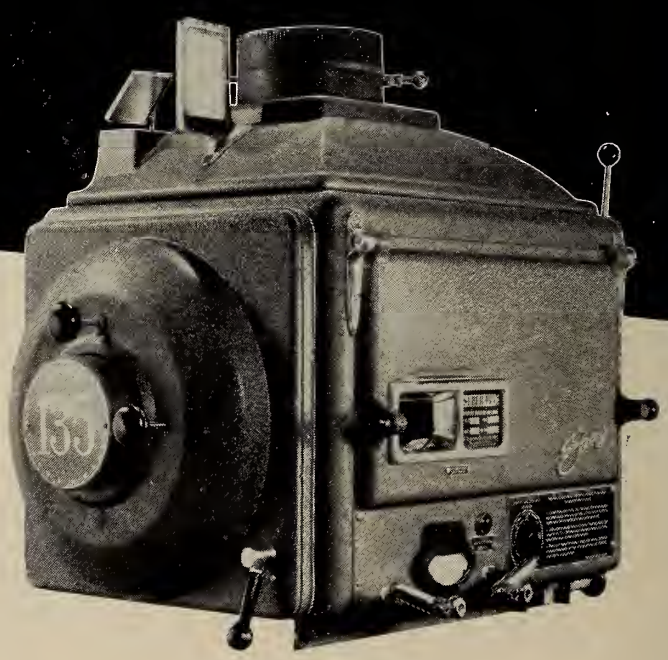
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INTERNATIONAL PROJECTIONIST

VOLUME XXX SEPTEMBER 1955 NUMBER 9

Recent Trends in Shutter Design For Theatre and Tv Projection

By ROBERT A. MITCHELL

The high optical speed of modern projection systems, and the great heat they generate, test the ingenuity of those who design shutters. Tv has brought additional problems.

OPTICAL efficency of a "film-reproducing system"—a theatre projector, for instance—is due largely to the design and placement of the optical components involved. These, in ordinary motion-picture projectors, are the arclamp mirror or condensing lens and the objective lens which focuses the tiny film photographs upon the screen in highly magnified form.

The older projectors utilized comparatively inefficient optical components, as both the arclamp condensing elements and the projection lenses were quite small in size. As a photographer might say, the old-time projectors were "slow," while modern projectors, with their large lamphouse mirrors and *f*/2 to *f*/1.5 objective lenses, are relatively "fast."

Light Bottlenecks

But there are several factors besides mirrors and lenses which influence the light-transmission efficiency of a film-reproducing system. The film aperture, that tiny rectangular window through which all the light that reaches the screen must pass, is such a factor. So also the revolving "occulting"* shutter which, in the average theatre projector, cuts off and wastes approximately half of the available illumination.

Because the shutter wastes so much of the light, it may seem advisable to redesign the projector in such a way that no shutter is needed. Before this difficult feat can be intelligently attempted, however, the twofold function of the shutter must be thoroughly understood.

The best way to understand what the shutter does is to remove it from a projector and show a film. When this is done it will be seen that the picture is approximately twice as bright as before, but it is also marred by flickering streaks of light which emanate from all bright objects in the picture. These streaks are known as "travel ghosts;" and, of course, without any shutter at all, the travel ghosts are very bright and extend all the way from the botttom of the screen to the top while the film is running.

Travel Ghosts

Travel ghosts are caused by the movement of the film as the intermittent sprocket pulls it down past the aperture at regular intervals, one frame at a time. If the action could be slowed down sufficiently without burning the film, this frame-shifting process would be seen on the screen, the pictures moving up from the bottom of the screen because the lens turns the image upside down.

But in actual projection without a shutter, the individual frame-shifts follow one another much too rapidly to be seen as periodic movements of the film. The eye, unable to follow the shifts, perceives only blurry streaks of travel ghost superimposed over the picture.

The shutter, then, is obsolutely necessary in the conventional projector to cut off the light and "occult," or hide, the projected image of the film every time the intermitttent movemen pulls the film down past the aper-

* The word "occulting" means to hide, and is used here to describe the action of the shutter in concealing the film during the pull-down period.

ture. But here again the rapidity of the process deceives the eye. Even though the screen actually goes dark at regular intervals, only a discontinuous series of still photographs being projected, the "persistence of vision" of the eye carries the images over through the intervals of darkness. Thus arises the illusion of a continuous motion picture.

How Flicker Occurs

Since there are 24 pulldowns of the film every second in standard projection, the occulting shutter must cut off the light at least 24 times a second to eliminate travel ghost. However, if a shutter is designed to hide or occult the film *only during the pulldowns* (that is, *only* 24 times a second), a terrific flicker will be produced. A cutoff frequently of 24 cycles per second is evidently too low to permit persistence of vision to "fill in" the intervals of darkness and create the illusion of a continuously illuminated picture.

Flicker in motion pictures is a complicated matter because it depends not only on the frequency of the cutoffs, but also on many other factors, the most important of which is the brightness level of the projected picture. It is definitely known that cutoff frequency must be increased when the brightness of the picture is increased, if flicker is not to become perceptible. Nearly everyone has noticed how the highlights in a motion picture, such as snow and clouds, often flicker while darker areas in the same picture are quite free from flicker.

Now, even if there are only 24 cutoffs per second, flicker can be eliminated by sufficiently reducing the brightness of the picture. Unfortunately, however, the highlight brightness must be no greater than ½ footlambert to conceal flicker when the cutoff frequency is only 24 cps. A highlight brightness of ½ footlambert corresponds to screen illumination of about 1 footlambert when the projector is run without film. This is far too little light for comfortable viewing.

Drive-in Light Levels

Screen brightness in many drive-in theatres ranges from 3 to 4 footlamberts, corresponding to highlight brightnesses of from 1½ to 2 footlamberts. These brightness levels tolerate cutoff frequencies as low as 28 - 32 cps., which means that the shutter *must* be speeded up to these frequencies to make flicker virtually imperceptible to the normal observer.

The rather low levels of screen illumination acceptable in drive-in practice are definitely inadequate for quality projection in regular theatres. The patrons of indoor theatres demand brighter pictures. Tests made with a wide variety of standard 35-mm. release prints, both black-and-white and color, indicate that screen illumination should be no less than 10 footlamberts nor more than 30 footlamberts for satisfactory projection. These screen brightnesses correspond to highlight brightnesses of from 5 to 15 footlamberts, and require shutter cutoff frequencies at least as high as 40 to 45 cps.

A 24 cps.-shutter is clearly unsuitable for projecting movies at screen-light levels of 10 to 30 footlamberts. Speeding up the projector to raise the cutoff frequency is out of the question. Fortunately, the general effect of faster shutter rotation may be obtained by adding a second blade. This expedient produces 48 cutoffs per second when film is projected at the standard rate of 24 frames per second.

Both blades of the 48-cps. shutter have the same angular width and are positioned symmetrically to give openings of equal angular width. One blade cuts off the light during the film pulldown, and the other blade cuts off the light for an equal interval of time in the middle of the "dwell" period when the intermittent sprocket is "at rest" and the film is motionless over the aperture. The first blade thus eliminates travel ghost, while the second blade eliminates flicker by increasing the cutoff frequency to 48 cps.

It should be clearly understood that the second, or "balancing," blade should have the same width as the first, or "master," blade. If the balancing cutoff is of shorter duration than the pulldown cutoff, more or less 24-cycle flicker will be produced.

Any shutter blocks the passage of a certain amount of light, and a 48-cps. shuttter wastes more light than does a 24-cps. shutter. The light-transmission of a shutter can be increased by trimming the blades to a narrower width, but we must not forget that the blades should be wide enough to hide the image during the entire pulldown process. An intermittent movement that pulls the film down sluggishly requires wider shutter blades than a quick-acting movement does.

Light Losses

The standard geneva movement used in most theatre projectors has a pulldown ratio of 3:1, meaning that this type of intermittent gives a dwell period 3 times longer than the pulldown period. If a 24-cps. shutter is used, occulting the image only during the film-pulldowns, only 25% of the light will be blocked off. But when a balancing blade is added to increase the cutoff frequency to 48 cps., the loss of light is fully 50%.

In actual projection practice the

(Continued on page 33)

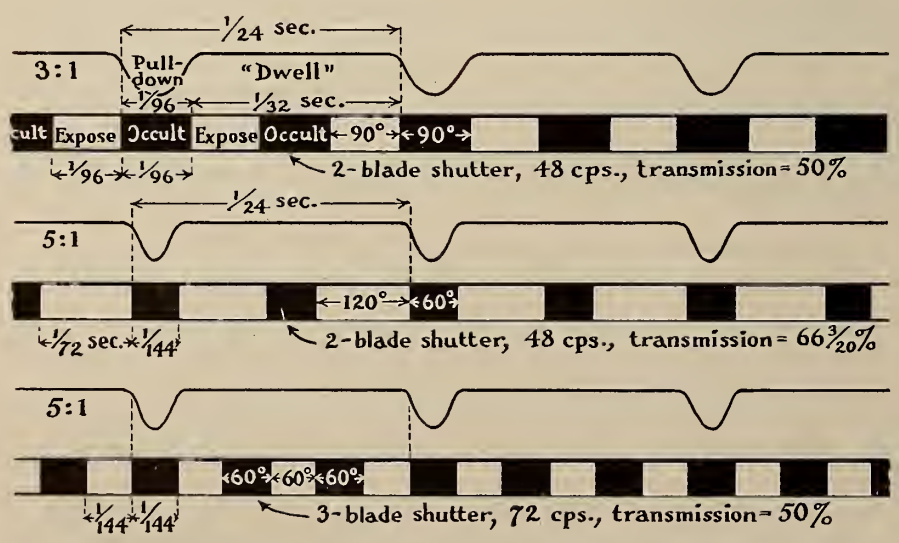
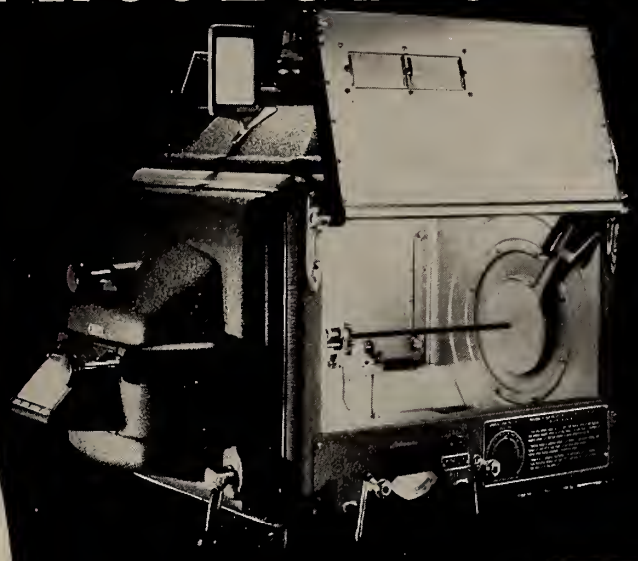


FIG. 1. Diagram illustrating the relative periods of exposure and occultation by three types of shutters used on motion picture projectors. The two shutters having 60-degree blades are suitable for use only with intermittents having a 5:1 ratio of "dwell" to "pulldown" time. The standard 3:1 geneva movement requires 90-degree shutter blades.

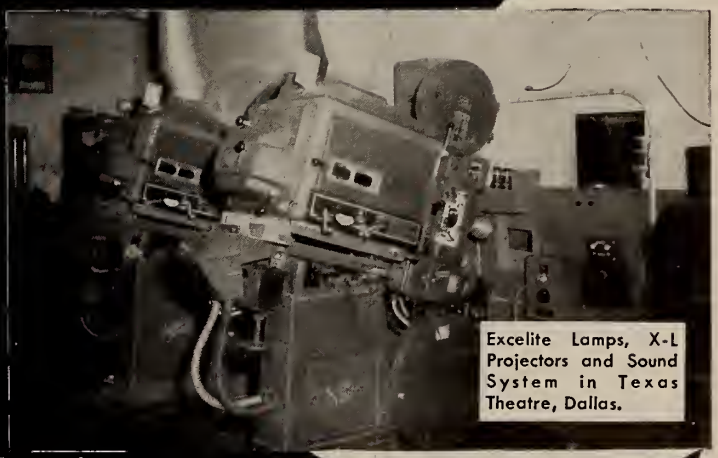
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- *The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.*

IT'S FROM N.T.S

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Imaginative use is made of 16-mm equipment at new California amusement park to project picture on screen that curves to full circle, and to provide illusion of space-ship travel.

Circarama: Spectacular 16-mm Presentation at Disneyland



This projectionist is adjusting his picture from behind the screen even though it isn't rear projection. It's the Circoromo at Disneylond where the screen curves to o full circle, ond eleven 16-mm projectors ore required to fill it. Eoch projector sends its beom through a port in the block mosking separating the ponels of the screen. All the beams crisscross in the center of the theotre ond eoch beom lights the ponel directly opposite its projector. The magozine shown lying flot at right of the projector is known as the Busch continuous mogozine. It can continuously project o loop of film os much os 400 feet in length without ony ottention from the projectionist.

MOST members of the craft have heard by now of the elaborate "Disneyland" amusement park recently opened near Anaheim, California, in the suburbs of Los Angeles. However, after crediting Walt Disney for his imagination and good business sense in devising this money-making sideline for himself, they probably dismissed Disneyland from their minds as a big roadside attraction for kids with no relation to the projection craft.

Nothing could be further from the truth! 16-mm projection equipment is being widely used at Disneyland in an original manner that points the way to interesting and lucrative new fields of employment for projectionists.

"Tomorrowland," is a section of this unique 160-acre amusement park which is attracting thousands of tourists daily with a clever preview of what the world will be like in 1986. This preview is accomplished primarily by the imaginative use of 16-mm motion picture projectors, often linked together in synchronization for displays that make the ideas of the Cinerama people seem tame.

The Ultimate in Screens

In one of the exhibits visitors are completely surrounded by a motion picture screen that covers the entire 360 degrees of a 40-foot-diameter circle. In another they are gripped by the illusion of blasting off in a rocket ship for a trip to the moon. Sound effects and rear-projected images in the windows or "scanners" of the simulated rocket ship create the effect of leaving the earth. A third exhibit explains with the aid of an unusual projection system how oil formed thousands of feet below the surface of the earth and how drillers of the future will bring it to the surface.

The most ambitious of the motion picture systems developed for Disneyland is one called Circarama which projects a continuous picture on a screen that curves to a full circle. Eleven Model 25 Eastman Kodak 16-mm projectors, using 1000-watt filament lamps and synchronized by Selsyn interlock motors, fill the eleven 8-foot by 11-foot panels of the round screen.

The feature presented is a travelogue called "A Tour of the West," sponsored jointly by Disney and the American Motors Corp. Admission is free with American Motors footing the bills for the advertising value of the show.

Although on a much smaller scale, Circarama goes even further than the well-known Cinerama in creating an illusion of reality for sweeping, panoramic scenes. Even so worldly-wise an observer as Tom Pryor, Hollywood correspondent of the New York Times, wrote: "the effect of viewing a motion picture that is going on all around you is fantastic. Particularly overpowering is the sense of motion, or moving with the picture." One of the scenes is a 90 mile-an-hour auto ride along Wilshire Boulevard in Los Angeles.

Projection Problems

The original plan for projecting Disney's Circarama involved projection from a gondola suspended in the center of the small theatre, but when it came time to draw blueprints, it was found that lenses of



Disneyland oudience obove is wotching the Circoromo screen thot curves to o complete circle 40 feet in diometer. Notice how the spectotors ore looking in oll directions, ond also notice the smoll projection ports located in the block mosking orea between the ponels of the screen. The projectors behind these ports fill the panels of the screen on the other side of the small theatre. Only port of the screen is visible in this illustrotion. Eleven Kodok Model 25 projectors ore used to complete the circulor picture.

such wide angle would be required for the short throw that the picture would be badly distorted.

After some thought it was decided to employ a "donut" shaped projection room that stretched completely around the back of the screen. Each of the 11 projection beams emerge from small ports cut in the six-inch-wide masking strips that separate the panels of the screen (see illustration).

Each beam fills the panel directly opposite its projector after criss-crossing the other beams. The audience does not interfere with the projection beams and is not bothered by the glare because both screen and projectors are raised a considerable height off the floor.

It was decided early to sidestep the problem of exactly dovetailing the edges of the 11 projected images that make up the circle. This is a complicated technical problem which is not completely soluble even with the finest 35-mm projection equipment, and has always plagued the engineers of Cinerama. Six-inch masking strips are used by Disney between the sections of the circular picture. It is believed that these strips are noticed only slightly by the audience. In any case they provide the space needed for the projection ports.

Synchronization of all 11 projectors was necessary. Eastman Model 25 projectors are driven with synchronous motors when furnished from the factory and, once started, remain in exact frame to frame phase under the precise control of the 60-cycle frequency power system.

Selsyn Interlocks Used

Left to themselves however, these motors would not start or stop in precisely timed relation to each other. For this reason Selsyn interlocks must be used on each of the 11 projectors to control the starting of the synchronous motors. The Selsyns deliver no power to the motors after they have reached the proper speed. The projectors are then driven by their own synchronous motors. Selsyn interlocks, needless to say, are familiar to projectionists involved in the late but little lamented 3-D splash of a couple of years ago.

The specific job of designing the Selsyn controls for all the 11 projectors and a sound reproducer was delegated by the Disney studio to J. C. Urban, head of Urban Engineering, Los Angeles. Urban worked in consultation with Dr. Edwin C. Fritts, the Kodak staff physicist who headed design and development on the Eastman Model 25 projector.

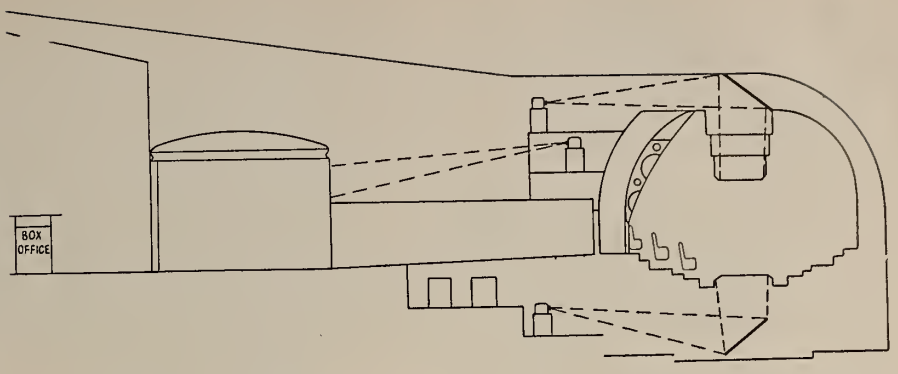
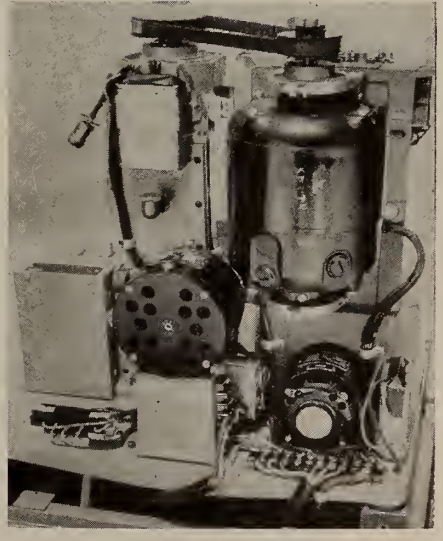


Diagram of another Disneyland theatre—the one where the "Trip to the Moon" takes place—is shown above. The room at right is built to resemble the interior of a rocket ship. The "take-off," projected on the screen at lower right, shows the rocket flames and the receding California coast line. Layers of clouds and finally the Moon itself are projected on the upper screen at right. Sound effects and vibration of the room help to create a powerful illusion. In the other room shown at left, waiting customers are "briefed" by a short film on what a ride in a rocket ship will be like.

It was also attempted to set up the projectors so that they would run as consistently and as automatically as possible. The two most likely show stoppers were felt to be film breakage and burnt-out bulbs.

A micro-switch on each projector guards against time-consuming snarls when a film break occurs. This switch rides over the film as it is wound back into a Busch continuous magazine. If the film breaks the switch closes and turns the projector off instantly. The short show is completed with one panel of the circular screen dark.



Close-up of one of the 11 synchronized 16-mm projectors used for the Circarama presentation. The large black unit in the foreground is the Selsyn interlock motor which is linked by belt drive to the projector's vertical drive-shaft. The motor that can be seen slightly lower and to the left is the standard synchronous drive motor of the Eastman Model 25 projector. The third motor beneath the Selsyn unit is needed in the Circarama installation to drive the projector back into line if it should fall behind in synchronization during a show.

The Busch continuous magazine mentioned above is a device generally used for 16-mm continuous projection systems where advertising sales messages and similar film material is shown continuously on relatively short loops of film. This magazine, which may be seen in the top illustration on the first page of this story, can take loops of film as long as 400 feet, enough to accomodate the Circarama travelogue. Equipped with these magazines, all 11 projectors can be operated continuously from a central control panel.

Automatic Bulb Changer

The burnt-out-bulb problem is solved automatically by a lamphouse arrangement that moves a new bulb into place and switches it on when the filament breaks in the operating bulb. This feat is accomplished by a relay held in place by the current passing through the lamp filament. When the filament breaks, the current holding the relay stops, and the relay snaps over to an alternate position, setting up a contact which carries current to a small motor mounted directly above it.

This motor activates a gear which revolves the rotary lamp housing.

(Continued on page 31)

A Stereophonic Sound System That Utilizes Haas Effect†

A method is suggested for employing a theatre's existing single-channel sound reproducer to reinforce a small two-channel stereosound system.

By **BRUCE P. BOGERT**
Bell Telephone Laboratories

CURRENT interest in stereophonic sound systems, both in the motion-picture industry and more recently in radio broadcasting and the high-fidelity field, makes it worth while to consider all methods of conveniently improving the spatial recognition of sounds. One such method will be discussed here and has particular application to the motion-picture theater sound system, as it involves the use of a large speaker to supply the required acoustic level, with lower power loudspeakers to produce the spatial effect.

In the ordinary stereophonic loudspeaking sound system, separate microphones pick up the sound from two or more locations, and the signals are transmitted or recorded in some fashion, to be reproduced by means of loudspeakers spatially separated. In a typical case, three microphones are used, with their output recorded on three soundtracks. These soundtracks are played back into three loudspeakers, located at the left side, the center, and the right side of an auditorium stage. Each of the sound channels has the same power capacity, in general, since the maximum sound-level requirement for each is similar.

Time Delay Inserted

The method to be discussed makes it possible, by inserting a small time delay in one channel, to reduce the power capability of the other sound-reproducing channels. We consider only the sound-reproducing part of the entire system, and suppose we have, for purposes of discussion, a recorded or live source of stereophonic sound material in the form of a mechanical magnetic tape, soundtrack or group of electrical signals. In particular, let us consider a 2-channel system employing loudspeakers on the left and right of an auditorium stage, as shown in accompanying illustration.

We combine the signals of the channels, delay them from 10 to 35 msec., *(a millisecond or one-thousandth of a second)*, and feed a central loudspeaker with this delayed composite signal, all in addition to the regular stereophonic system. The effect of the additional centrally located sound source is to increase the sound level in the auditorium without appreciably altering the spatial localization due to the binaural effect.

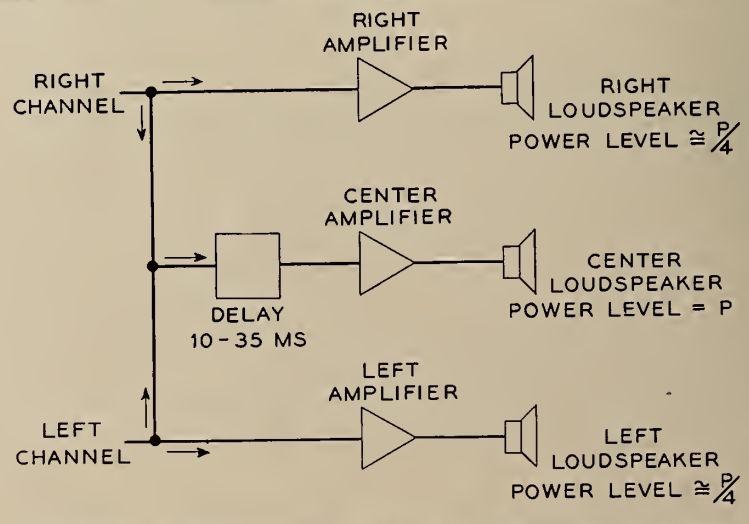
The reason that this is possible appears to be due to the so-called Haas effect. Haas made studies of the intelligibility of speech with various time delays between the direct sound and an echo. When the delay between the direct source and the delayed (echo) source is small (1-30 msec), the apparent source is the direct one, and the delayed source does not appear to be operating, except in that it contributes to the total loudness. This effect is independent of the location of the sources, and the delayed source must be as much as 10 db *(decibels)* more intense than the direct one before the delayed source is perceptible as such.

Limits of Delay

If the delay is greater than some critical value, the delayed source becomes obtrusive, and the effects described above disappear. The critical value ranges from 40 to 100 msec for speech, depending on a number of factors including the relative intensity and the frequency spectra of the direct and delayed sources.

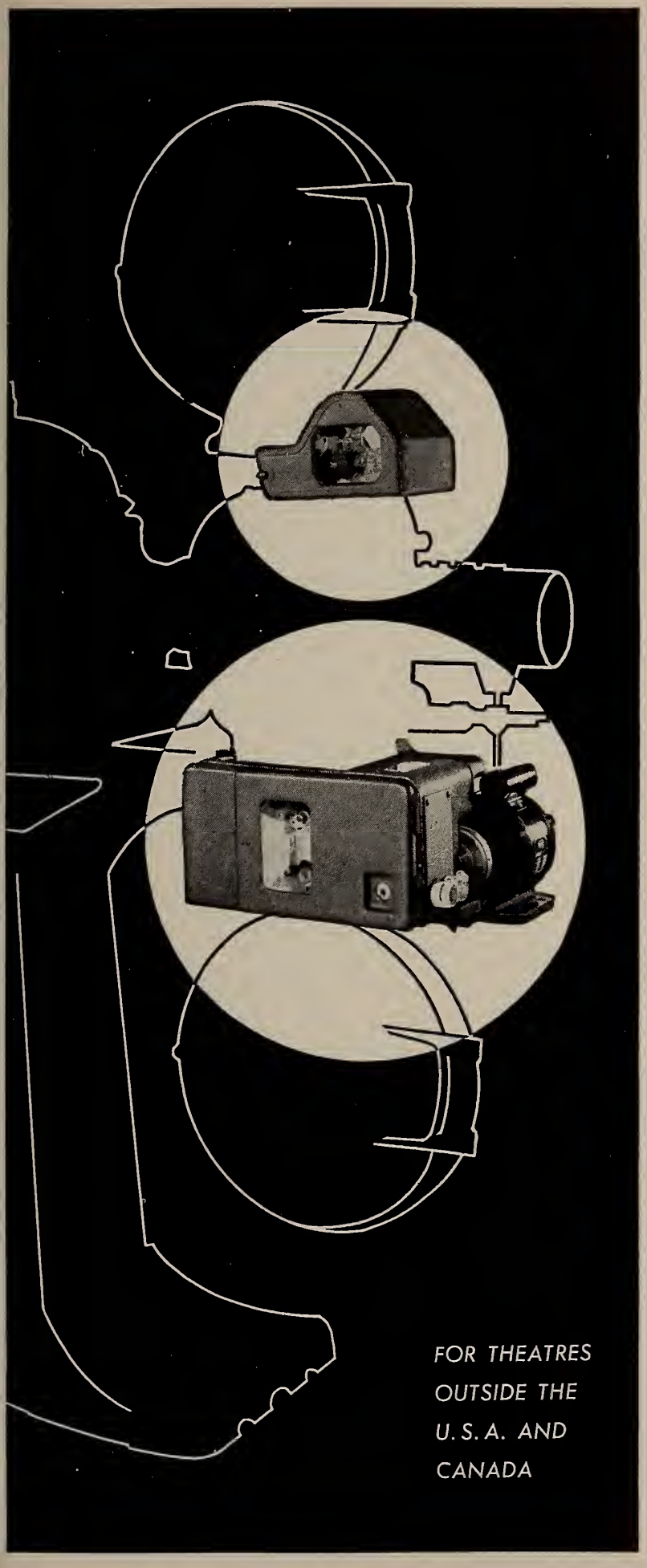
A test was made of this method in the auditorium at the Murray Hill Laboratory of Bell Telephone Labs. A binaural magnetic tape of classical orchestral music was used as a source. The tape was reproduced on a dual-track magnetic tape recorder, and the two outputs were amplified and connected to the left and right loudspeakers behind the auditorium stage.

The two amplifier outputs were also mixed and connected to a recorder-reproducer machine that could be adjusted to operate at a tape speed of either 30 or 60 ips *(inches per second)*, providing a delay between the recorded and reproduced signal



Two-channel stereophonic sound system with added combined signal sent through a delaying circuit to a center speaker. It is thus possible to raise volume without injuring the stereo effect from the two side speakers.

† Journal of the SMPTE, June 1955.



Westrex

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of either 69 or 34.5 msec, respectively. The frequency response was partially equalized for the 60-ips tape speed. The equalization for a tape speed of 60 ips was not particularly effective for the lower speed. The signal-to-noise ratio for the 60-ips tape speed was about 35 db.

The delayed output was fed into the power amplifier driving the center speaker in the auditorium. By varying the delay-unit reproduce gain, the power output of the center speaker could be adjusted from zero up to 15 or 20 db greater than the output of the left and right loudspeakers.

With the binaural program material, the relative levels were equalized from the left and right speakers, with the center one inoperative. Using a delay of 34.5 msec, the level of the center speaker was raised gradually until observers in the center of the auditorium could just notice the presence of sound emanating from the center speaker. The program source was then replaced by an oscillator feeding one of the binaural channels only. The difference between the sound levels of the center speaker and the other was measured, and it was found that the level of the center speaker was from 8 to 12 db higher than that of the left or right one.

Limitations of System

Further listening tests with more observers indicated that a program level in the center speaker 8 db above that in the left and right speaker was not noticed in the treble range, but the apparent position of the bass instruments seemed to move toward the center with a level difference greater than 5 db.

When the delay was changed to 69 msec from 34.5 msec, by a speed change in the delay unit from 60 ips to 30 ips, the stereophonic property of the system could no longer be observed. The sound appeared to come from the center speaker only, and the overall effect was that of a standard single-channel sound-reproducing system.

The lower relative levels of the left and right channels with respect to the center one could most easily be observed when the program material radiated from the center speaker was not the same as that radiated from the left and right ones. This could be done by using the delay unit as a tape

(Continued on page 31)

Versatile New Simplex Sound Systems

NATIONAL Theatre Supply now has available a new series of Simplex XL sound systems designed especially for theatres with outmoded optical sound and for those theatres where modern magnetic stereophonic sound is desired.

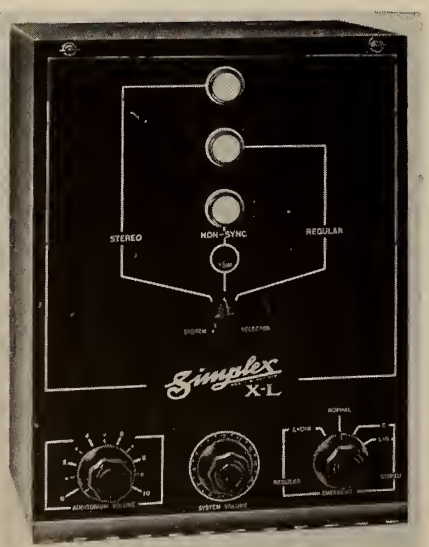
The new systems provide regular optical operation from existing optical soundheads and exciter lamp power supply, while obsolete optical sound components are completely replaced. If a 4-channel stereophonic sound installation is purchased, the existing power amplifier may be incorporated in the new system if desired. The new systems are known as the Simplex XL-500 line.

Both optical and magnetic controls are integrated so that a single sound changeover box at each station provides for both stereo and regular changeover. Undesirable duplication of optical and magnetic changeover controls on the front wall are eliminated by a compact new control cabinet.

A valuable feature of the new systems is the unique changeover setup which allows the projectionist to switch from optical to magnetic, *vice versa*, or to non-sync merely by pressing one button at changeover time. This is possible because with the new control system for the XL-500 the projectionist can preselect the type of sound desired while a reel is running.

Emergency Safeguards

Another important feature is a conveniently-located emergency selector switch which will provide for standby operation under all conditions. If necessary, stereo sound from the center channels can be mixed with the left and right channels. Sound from the left and right channels can be mixed into the center channel only. It is also possible to play regular optical sound through all three power amplifiers and backstage speakers.



New Simplex sound control panel combines optical and magnetic controls.

Built-in facilities for the non-sync input are also provided as was mentioned above. During the last reel of the show, the system pre-selector switch is set at "non-sync," and changeover to non-sync is accomplished at the end of the reel by depressing the non-sync changeover button located on the control box.

The same volume control is used for both regular optical and magnetic stereophonic sound. A separate volume control is provided for the fourth channel so that auditorium effect speakers, where installed, can be closely regulated to suit the program.

Compact Control Panel

All operating controls are conveniently located on the front wall of the projection room, and all except the changeover buttons are located on the front of the compact control cabinet. Provision has also been made for the addition of a third projector, with either optical sound or both magnetic and optical. Plug-in optical and magnetic pre-amplifiers provide for easy replacement and service.

This packaging of previously separated system components in a single control cabinet takes up a minimum of wall area and saves projection room space for any additional equipment that may be needed in the future.

A glance at the accompanying illustration will show that the control cabinet is both compact and complete. At top center can be seen three lights that indicate the type of sound being played—regular (optical), stereo or non-sync. The non-sync changeover button is located directly beneath its light. Below this button is the pre-selector switch which enables the projectionist to set the type of sound for the next reel at a convenient time before the changeover.

At lower right is the emergency switch which makes it possible to play the sound from the center horns over the left and right speakers, and *vice-versa*, if necessary. It is also possible by means of this switch to play optical sound over all three horns at the same time, thereby avoiding a drop in sound level when optical follows magnetic sound. The center switch regulates volume of the stage speakers, and the left switch regulates the volume of auditorium speakers.

Recent Developments in Anamorphotic Systems

This is the final installment of an inclusive article on the development and practical application of anamorphotic lens systems. It was first presented before the British Kinematograph Society.

By G. H. COOK

Member, The British Kinematograph Society
Technical Staff, Taylor, Taylor and Hobson, Ltd., London

NOW consider the projection lens itself. Poor definition arising from poorly-corrected projection lenses is *magnified* by the anamorphotic attachment in the *same proportion as the expansion ratio.*

To demonstrate this, an image was screened by the type of projection lens which has been standard cinema equipment for a considerable number of years. It was pointed out that although its simple construction provided an adequate standard of definition in the centre of the screen, field curvature and astigmatism set a limit to definition at the edges.

Such marginal errors enlarged by anamorphotic attachments are not acceptable on very large screens. The need for improvement has resulted in the introduction of a new range of lenses of high definition. The degree of improvement now available was demonstrated by a screen image projected with a new lens of the same focal length.

The development of anamorphotic systems is still in its infancy, but as far as the exhibitor is concerned, the equipment now available for use on standard projectors will be adequate for a number of years.

Release Print Processing

The most severe optical problems occur in the processes used to produce release prints. When attachments which function in the described manner are used at the camera stage to record on the negative a compressed picture, they have to provide angular fields of view considerably greater than those required in projection. To add to the difficulties, the camera attachment is also required to give good definition over a considerable range of object distances from infinity to close-ups.

At present it is thought that cylindrical types of attachments are the only constructions that can perform under such extreme conditions and they are being developed in forms which utilize more complex and more numerous components compared with the relatively simple constructions used for projection.

The use of large anamorphotic attachments on a studio camera and the associated loss of light by absorption and scatter presents its own problems. Small studios may have limited camera and processing facilities, thus it appears that the use by them of camera anamorphotic attachments provides the easiest method of producing anamorphotic prints.

Future Developments

On the other hand, the larger studios are not always limited in this manner, and, looking into the future, it may be that they will use cameras with larger negative areas, such as VistaVision, to photograph wide-angle scenes in the usual way. The straightforward negatives so produced can then be compressed at an optical printing stage to provide compressed release prints for projection. The advantages of such a process would be:

1. The use of normal type camera lenses avoiding the light losses, definition losses and extra bulk arising from anamorphotic attachments.
2. The use of larger negative areas whose grain and definition is improved by reduction printing.
3. The use of anamorphotic systems at the printing stage where the angular fields to be covered can be small and where they need only work at fixed conjugate distances, and
4. The ability to use one negative for the subsequent production of release prints compressed in any ratio to suit any screen aspect ratio or, alternatively, for the production of normal prints.

When it is realized that positive emulsion has finer grain and can *store more picture information* than negative emulsion, the advantages of optical reduction between negative and positive becomes obvious. It has in fact been well demonstrated in the VistaVision process and the advantage applies equally well to anamorphotic printing.

Vertical Graininess Reduced

Anamorphotic projection assists the visibility of a screen picture by reducing *vertical* grain because the higher projector gate aperture and larger film picture needed less vertical magnification.

Another sample image obtained by a large straightforward negative having been compressed *horizontally* in printing, and the resultant positive projected anamorphotically, reduced the horizontal grain so that grain was reduced in *all* directions to give a further improvement in picture visibility.

Discussion on Foregoing:

MR. CRICKS: First, on this question of light transmission from the small and large apertures. A point which is often overlooked is that one can reduce the size of the gate spot for the wide-screen picture. Mathematically, it appears that there is no difference in screen brightness for any ratio, squeezed or anamorphotic. My limited experience seems to bear this out.

Second, Mr. Cook did not mention the mirror system which has the effect of being able to cure the curvature distortion inherent in the curved screen. Can Mr. Cook explain how that occurs? It seems very mysterious to me.

Gate Area Vital Factor

MR. COOK: On the first point, I think you are suggesting that the focus of the arc crater can be different for smaller and larger gate. I am not qualified to give an opinion on that. Certainly it would appear that the effect does exist, but I am doubtful whether it can equalize illumination passing through two gate areas where one is double the area of the other.

As for the mirror system, this works on a

(Continued on page 29)

After the Last Shot Is Made The Technicians Take Over

It takes three months of effort by film editors, and lab and sound technicians to turn a crude work print into a polished feature film. This article is reprinted through the courtesy of the *International Cinematographer*.

By ALLAN BALTER
20th Century-Fox Studios

AFTER the final scene has been shot on a production, the tremendous aggregate of talent and know-how whose labors fall in the general classification of "post-production" takes over.

The twelve to fourteen weeks that elapse between the final "Print it!" and the day the picture is given its first preview is a sort of mysterious hodge-podge of technical activity about which many who are outside the very top production offices of the studios know little. Invariably there are added scenes to shoot, and we know that music gets added somewhere along the line, but that's about as far as many of us go in post-production knowledge. Actually, the amount of work and artistry that is crammed into that short fourteen weeks is nearly unbelievable.

Editors Take Over

Take, for example, the average feature production here on the 20th Century-Fox lot. The departments that are actively engaged in post-production activity take over immediately at the close of shooting. As a matter of fact, a small amount of what is actually post-production work goes on during the shooting. This would especially be true in case some dubbing or narration were needed and the actor involved had some time away from the set coming to him. By and large, however, the bulk of the work is done after photography closes. Though much of the work we are about to describe is done simultaneously, for purposes of clarity, we will deal with each step individually as we take our hypothetical film through the post-production steps.

Shooting finished, the film editing department under Jerry Webb, takes over. The first man to actually do post-production work on a film is the editor. As the picture is shooting he keeps everything cut and within a few days after photography closes he puts together the "first cut." This finished, it is run for the director who, with the editor, may make certain changes in construction along with effecting a general tightening of the picture. This tightened version, incorporating the director's changes, is then run for the producer who may also make certain changes. Then, given the producer's and director's stamp of approval, the print is run for Mr. Zanuck who may also make changes, eliminate some things, rearrange continuity and possibly decide on some added scenes which are worked out with the director and the producer.

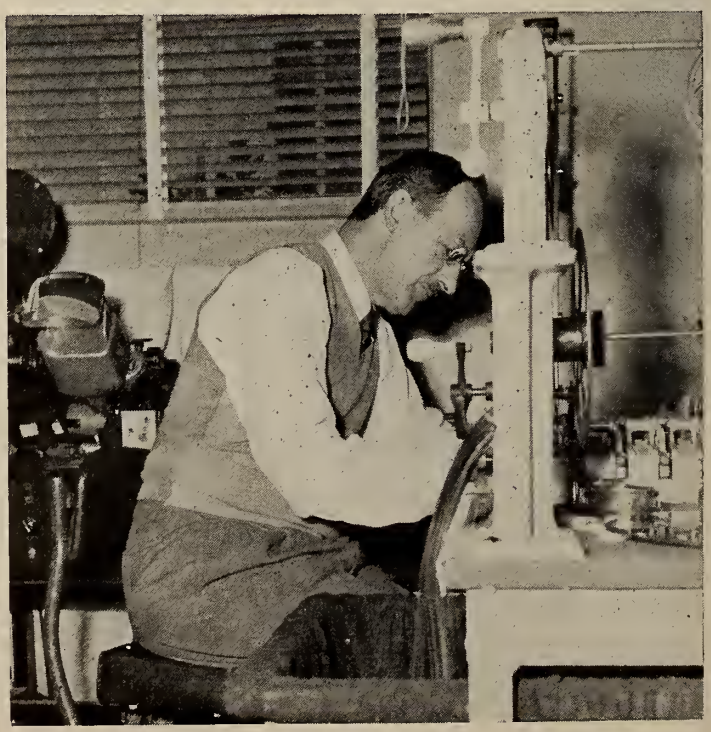
These added scenes are then scheduled as soon as possible so that they may be shot before the cast has scattered and the sets struck. The finished added scenes are incorporated in the picture by the editor, along with all changes, then the final cut is again run for Mr. Zanuck, the producer and the director. Their final approval then sends the picture on to the next phase in the post-production cycle.

Music Is Written

From the print ok'd by Mr. Zanuck a dupe is made which is sent to the music deparment. In the meantime, the composer assigned to the picture has been sitting in with Mr. Zanuck and the producer and director during screenings of the picture so that he has a good idea of its actual construction and sequence arrangement. Alfred Newman and his music department run the dupe, which is studied by Newman and the composer and the music cutters. The picture is run reel by reel and it is decided where, and how much, music is to be used.

The music cutters then break down the picture, timing it out in careful detail, and the composer writes his music to these cues. The music written, it is orchestrated by Ed Powell and the music is recorded to projection to fit the picture.

These recordings then go to the music cutters under Leon Birnbaum



Addition of sound effects such as door slams, crowd noises, etc., is a vital post production activity. These are added to soundtracks on 20th Century-Fox films by sound effects editor Alfred Ross.



Before the musical score for a picture is prepared, each reel must be carefully timed and cued for the composer and the scoring staff. At Fox this is handled by music editor George Adams and assistant Ken Runyan.

and they build the music tracks, synchronizing the music to the action. The impact and artistry that the music department contributes to a picture is almost immeasurable. The only way one could possibly begin to understand what a picture would be without music is to run one that way. It's a shocking experience.

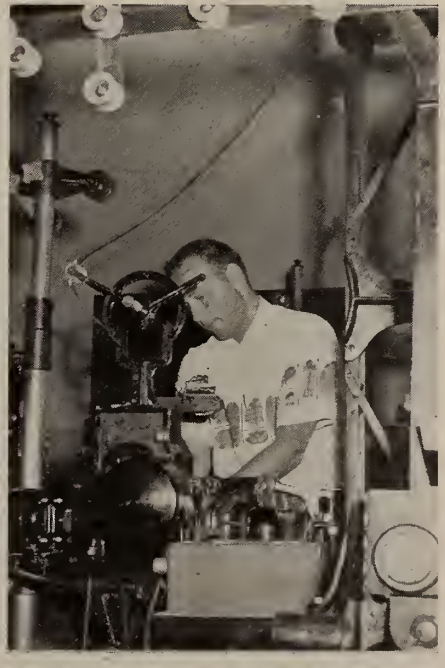
Sound Effects Added

While the Music Department is working on scoring and building the music tracks, the dubbing and sound effects editing department is at work building the effects tracks. Though some of the dubbing is done during production, as we pointed out, the bulk of it takes place in the post-production period. Dubbing is necessitated by a variety of circumstances. Perhaps someone sneezed on the set at the wrong moment or an arc might have started to whine. On location a jet might swoop overhead. To correct any of these or the thousand-and-one other little things that fall in the general classification of "extraneous noises," Walter Rossi and his crew dub the dialogue and cut and fit it to the track. In addition to dubbing, any narration that might be required in a short or feature is done at this point while the narrator watches a print being projected.

One of the most monumental tasks is the sound effects editing this department also handles. Effects editing starts with a series of notes taken when the dupe is run by Rossi and the director and producer. Each of the effects editors is then given one or two reels for which he will build the effects tracks based on notes made during the screening. The tracks are cut and new effects cut and fitted and synced. As many as sixteen separate tracks may be built for a single reel. The effects that are necessary are usually available to the editors in the studio's sound library where millions of feet of track is stored in thousands of categories. However, if the particular effect an editor may require is not in the library, then Rossi and his crew have to create it.

As an example of the lengths to which they go for realism in sound effects, to get the right sounds for the auto racing action in "The Racers" Rossi took a crew to a local sports car race where they recorded the cars roaring past. They even strapped a portable tape recorder to the seat of one of the cars where it picked up all of the sounds that were typical to the interior of a race car as it sped around the track.

While all this has been going on the editorial department has been hard at it on technical work. Laps, fades and other optical effects are created by Jimmy Gordon's optical printing department. Main titles are added and, when necessary, inserts by Bernie Cooper.



All the various soundtracks made during and after the shooting of a picture are finally channeled into the re-recording department, where the "grand finale" of the complicated post-production technical effort takes place. Shown here is Don Rogers, of 20th Century-Fox, threading a re-recording machine.



Dubbed-in dialogue, once it's recorded, is carefully edited and fitted to each reel of film by highly-skilled technicians such as assistant sound editor Duane Hensel.

As each of the post-production departments finishes its work, it is sent to the re-recording department. There, under the careful hand of Warren Delaplain, what is sort of a "grand finale" of post-production effort takes place. The dozens of tracks that have been created for each reel—a skillfully integrated melange of dubbing, sound effects and music are gathered here. The totals for any given reel may run as high as 32 separate tracks. To combine that many tracks for one reel is not only unwieldly but is more than can be recorded at one time. Therefore, the collection of tracks is reduced to what the department calls "combines" or "generations." Usually, these combine the "knowns" or constant elements that are not likely to be changed. This done, the tracks are ready to be re-recorded.

Re-Recording Process

This re-recording step is one of the most impressive and wonderful processes we have ever seen. On the huge platform in Stage 2, the mixers sit at their panels alongside the picture's editor, the director, producer, music director and the sound effects and music editors. It is in this process

(Continued on page 28)

In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

THE California State Theatrical Federation, comprised of AFL Unions representing 67,000 workers in the entertainment field, adopted a resolution against "runaway" production in foreign countries of filmed commercials for American products designed to be used on American Tv stations. The resolution was particularly aimed at one of the large pharmaceutical houses for producing abroad a series of filmed commercials advertising its products on Tv. This action, according to the resolution, "is an evasion of American Labor standards."

● More than 125 delegates and many visitors attended the 27th District No. 7 convention held in Chattanooga, Tenn., July 27-28. Of the 103 IA Locals in the District (comprising the states of Tennessee, Alabama, Georgia, Florida, North and South Carolina, Mississippi, and Louisiana) only five failed to send delegates to the conference.

IA President Richard F. Walsh and Stanton E. Smith, president of the Tennessee Federation of Labor, were the principal speakers. In his address, Walsh urged that Local Unions lend more generous support to Labor's League for Political Education. He pointed out that a number of states have enacted laws restricting trade unionism. "Labor's friends in the various states must be supported," stated Walsh. . . . "Our lives as unions are controlled by political action, and we must support our interests." Walsh is a member of the executive board of LLPE.

● R. E. "Rut" Morris, secretary of Local 519, Mobile, Ala., was unanimously re-elected secretary of the 7th District, a post he has held continuously since 1923. Morris has been a member of the IA for 43 years, and has served as an International trustee since 1932. He also holds the offices of secretary and business representative for Local 142 (Stagehands) in Mobile. All in all it looks like Morris has a pretty full schedule.

● The newly proposed constitution and by-laws of the amalgamated AFL-CIO and more intensive organization of the Tv field were among the leading topics discussed at the recent IA executive board meeting in Chicago.

● L. J. Patton, popular Eastern division manager for Altec Service Company, and Mrs. Patton recently celebrated their 25th wedding anniversary by a flying vacation tour of the states of Washington, Oregon, and California.

● The 25-30 Club of New York held its first meeting of the season on September 8. A feature of the meeting was the demonstration of the Simplex X-L water-cooled head *(see IP for December 1954, p. 13)*, and the question and answer session immediately following. William Borberg, chief mechanical design engineer for General Precision Lab, was in charge of the demonstration and he more than held his own in answering the many queries thrown his way. Naturally, all the top brass from International Projector Corp. and National Theatre Supply Co. were on hand to help make this a most auspicious evening.

Incidentally, the Club will hold its annual dinner-dance on Sunday, January 8, 1956, at the Hotel Empire, Broadway and 66 Street, New York City.

● The recently-chartered IA Local 855, New Glasgow, N. S., was successfully organized by Sister Local 848, Sydney-



Candid shot taken at the picnic grounds at Lake Chickamauga Dam during the recent District No. 7 conference. Left to right: E. J. Miller (L. 279, Houston, Tex.), IA representative; A. S. Johnstone (L. 293, New Orleans, La.), 6th IA vice-president; and R. E. "Rut" Morris (L. 142 and 519, Mobile, Ala.), the District secretary.

DISTRICT NO. 7 HOLDS ITS 27TH ANNUAL MEET AT CHATTANOOGA



Shown above photographed at the speakers' table in the Convention Hall of the Hotel Patten where the conference was held are, left to right: J. Burton Lowry, president of Chattanooga L. 259 and chairman of the Convention entertainment committee; R. E. Morris (L. 519, Mobile, Ala.), IA trustee and secretary-treasurer for District No. 7; John N. Spearing (L. 511, Jacksonville, Fla.), special IA representative; IA President Richard F. Walsh, and Albert S. Johnstone, (L. 293, New Orleans, La.), 6th IA vice-president and Convention chairman.

Glace Bay, N. S. The New Glasgow Local now has jurisdiction over seven indoor theatres plus two drive-ins.

● A highlight of the banquet recently tendered by Detroit Local 199 was the award of gold life membership cards to ten surviving charter members. Another high spot of the evening was the presentation to the Local of an oil painting of its late business representative, Roger M. Kennedy. This painting, presented by member Jacob Gross, now occupies a place of honor in the Local's headquarters.

Among the invited guests present were IA President Walsh and J. A. Shuff, 8th IA vice-president. Gilbert E. Light, Local 199 president, was the toastmaster of evening. Floyd H. Akins, chairman of the banquet committee, was assisted by Melvin E. Donlon and Edgar A. Douville.

● The New York State Association of Motion Picture Projectionists will hold its annual Fall meeting on Monday, October 3, at the American Legion Club in Syracuse, N. Y. Two sessions are planned for the meeting, with the afternoon session opening at 2 o'clock. Host Local 376, Syracuse, has planned a big day for the delegates, with a midnight banquet winding up the day's activities.

GOLD CARDS TO DETROIT LOCAL 199 CHARTER MEMBERS



Gold life membership cards were recently presented to ten surviving charter members of Detroit Local 199 at a midnight banquet held in the Grand Ballroom of the Federation of Labor Temple in that city. Standing in the back row, second and third from left, are invited guests IA President Richard F. Walsh, who made the presentations, and John A. Shuff, 8th IA vice-president. Front row, left to right: Henry Falk, Edward Foster, Sherman J. Lambly, Wilbur Jose, John J. McDonald, and James R. Powers. Rear, left to right: Timothy J. Kirby, Walsh, Shuff, Lloyd A. Burrows, Earl J. McGlinnen, and D. Cass Newell.

25 Years Ago—September 1930

● An independent survey showed the following breakdown of theatres in the United States wired for sound: *Producer controlled* — Paramount-Publix, 1013; Fox, 601; Warner Bros., 402; RKO, 119; Loew's, 117. *Circuit* theatres not producer-controlled were estimated at 1213. *Independent* houses wired for sound numbered 6769. . . . IA Local 686, Balboa, C. Z., received its charter. . . . William C. Elliott, 1st IA vice-president, pinch-hitted for IA President William F. Canavan, who took a leave of absence to recuperate from recent illness. . . . Howard Hughes' four million dollar production, "Hell's Angels," opened in New York City. This was the first motion picture made with 100% union workers.

● In a recent election conducted by the NLRB, the IATSE, was chosen as the collective bargaining agent for the program employes of Tv station WAAM, located in Baltimore, Md.

● The Circarama showing at Disneyland employs a crew of 18 projectionists headed by chief projectionist Ralph F. Adams, business representative of Local 504, Santa Ana, Calif., and assistant chief projectionist, W. L. Coleman, secretary of the Local.



John A. Shuff, 8th IA vice-president, presenting a portrait of the late Roger M. Kennedy to Detroit Local 199 on behalf of Jacob Gross, who donated the painting.

● No mere lip service does William H. Moran, secretary and business representative for Local 86, Fitchburg, Mass., render to the cause of craft unionism. His labors in behalf of his fellow workers are many and seemingly never ending, but he takes them all in stride. In addition to his duties as an official of Local 86, Moran plays a leading role in the activities of the Fitchburg Central Labor Union, of which he is president; and of the Massachusetts Federation of Labor, in which he was recently re-

(Continued on page 28)

LOCAL 855, NEW GLASGOW, N. S., RECEIVES IA CHARTER



IA charter is presented to the officials of the recently organized New Glasgow Local 855 by Hugh J. Sedgwick, 5th IA vice-president, who presided at the installation ceremonies. Pictured above, front row, left to right: Gerald Davis; Sedgwick; Thomas Davis, L. 855 president; James F. McGuire, business representative, and Robert Emmery, vice-president. Back row: Gerald Phinney; Harold Haley, recording-secretary; John A. McGuire, and George McGrath, treasurer. Local members Douglas F. Smith, financial-secretary, and Charles Archibald, are not shown here as they were unable to be present when the picture was taken.

A Difference of Opinion on "Light-Collecting Speed"

A NEW system to measure the ability of a projection lens to transmit light was recently announced. It depends on a rating known as "light-collecting speed," which is obtained by dividing the diameter of the rear element of a lens by the distance between the rear element and the film. According to Dr. John R. Miles, an optical design engineer who developed this system, the bigger the rear element used in the design of a projection lens, the more light it becomes possible to transmit—even if the other elements do not increase in diameter.

Two opinions follow. In one, Dr. Miles restates his ideas on light-collecting speed which were presented before last Spring's SMPTE Convention. In the second, Mark Stevens examines the light-collecting-speed idea and takes the position that it is neither a valid nor a useful standard for measuring light transmission.

By JOHN R. MILES

Consultant, Projection Optics Co.

THE NEW TERM "Light Collecting Speed" is a useful expression for rating a very important factor in the efficiency of theatre projection lenses previously difficult to specify. This expression describes the ability of the lens to provide adequate illumination to the edge of the screen.

Light collecting speed was defined in the author's paper, presented to the recent SMPTE Convention in Chicago, and is simply equal to the distance of the rear element of the lens from the film, divided by the *used* diameter of the rear element. This is not an arbitrary definition in any sense, because it is the only expression of this type yet defined which indicates the fall-off in illumination for a particular lens, at the edge of the screen.

It is unfortunate that *light collecting speed* should be confused by some with *f* number and *T* stops,* for there is no particular relationship between *f* number and light collecting speed, nor is there any relationship between *T* stop and light collecting speed.

Theatre projectors are in a special category, in which the lamp-house mirror, in practically all cases, controls the *f* number of the projector's optical system. Since the mirror is *f*:2 in nearly all theatre projectors, the speed at which the projection lens functions is *f*:2, regardless of the basic *f* number of the lens. This, of course, assumes that the lens is *f*:2, or faster, and, for practical purposes, we can assume that all modern projection lenses *are* faster than *f*:2.

The fact is that the *f* number "speed" of projection lenses was made faster than *f*:2 in an attempt to improve the edge illumination on the screen, due to the simple observation that a *larger* lens will, by first analysis, pick up more light, and improve this edge illumination. It should be carefully noted, however, that this is not always the case. In fact, it is quite possible that a given *f*:1.7 lens, with a high *T* stop rating, will give less light on the edge *and* the center of the screen than another lens which has a speed of *f*:2 and a lower *t* stop rating. The cause for this seeming paradox is the projection mirror which is *f*:2. (When the faster mirrors of *f*:1.7 etc. are in common use, the same philosophy will apply at the next level of *f* numbers.)

How System Originated

When the writer had the opportunity of selecting the type of basic lens design for the new *super hilux* lenses, manufactured by Projection Optics Co., of Rochester, N. Y., he wanted to overcome the fall-off in illumination, insofar as it was possible. In doing so, he worked out a lens formula which has a rear element as large as the tube of the projectors will allow, and placed as close as possible to the film, still permitting the opening of the film gate on all models of projectors. When these new designs were ready, we used the term, "light collecting speed," to describe this accomplishment.

In order to understand more fully this property of light collecting speed, let us consider a 4-inch projection lens. This lens is *f*:1.5, and is made of six lenses, in which the rear lens element is 1 inch in diameter, and located at a distance of 1½ inches from the film. The light coming from the mirror at the edge of the frame spreads out in a cone, so that approximately half of this edge light goes to the left, and half to the right of a line straight out from the edge of the film gate. Since the film gate is approximately 1 inch wide, and the rear element is 1 inch in diameter, it is obvious that more than half the light at the edge of the frame is lost.

Now, let us take an *f*:1.8 lens, with five elements, where the rear lens element is 1½ inches from the film, but the diameter of this rear lens element is now 1½ inches. It can be seen easily that this rear element will pick up nearly all the light coming from the mirror, actually 5/6 (83%) of the edge light, or a 66% gain in *edge* illumination all due to light collecting speed. The *f* number speed is of lesser value and the *T* stop rating is less, and yet the lens gives more light in the center because of less glass (5 lenses instead of 6), and far more light on the edge because the light collecting speed is high (*f*:1, instead of *f*:1.5).

It would seem that the above examples should prove to anyone that the *light collecting speed* is a very valuable means for specifying the edge illumination factor for theatre projection lenses, when used in a normal theatre.

*A complete explanation of f numbers and how they are derived, plus a definition of T stop will be found early in the accompanying article by Mark Stevens.

By MARK STEVENS

I DISAGREE entirely with the use made by Dr. John A. Miles of his term, "light-collecting speed," in rating the efficiency of projection lenses. After studying the paper on the subject presented by Dr. Miles at the Spring Convention of the SMPTE and also reading the article by him published here, I still find the standard *f* system to be the only accurate and reliable means of judging the ability of a lens to transmit light.

Every projector objective lens intercepts a cone-shaped beam of light. Whether or not the cone picked up and utilized by the lens includes all of the light which emerges from the aperture depends upon the size of the lens, its focal length, the size of the aperture, the size of the lamp mirror, and the distance of the mirror from the aperture.

The "faster" (larger) the lamp mirror, the greater the "spreading out" of the cone of light emerging from the aperture—requiring, of course, a faster lens to collect all of it. Now, the real "speed," or light-collecting *power*, of a lens is specified by its *f*-number rating.

The *f*-rating of any image-forming lens is the focal length divided by the open diameter.

The effective open diameter of a projection lens may be greater or smaller than the actual diameter of any particular element of the compound lens—*that* depends upon the optical design of the lens, a matter of little concern to the average projectionist. The important point is that the *f*-speed of a projection lens specifies its light-collect-

ing efficiency. *There is no other widely accepted specification for this property of a lens.*

A small amount of light may be absorbed and wasted by a projection lens, especially if any of the individual lens-elements be thick, not cemented together, or without anti-reflection coatings. In such cases two different lenses of the same *f*-rating may not transmit and send to the screen equal amounts of light. One lens will give a slightly brighter picture than the other even though both have the same *f*-speed.

In order to specify the actual light-transmission properties of lenses, many optical manufacturers divide their *f*-numbers by the percentages of actual light-transmission and call the results "*T*-numbers." A *T*-number is always slightly greater numerically than the *f*-number of a lens because no lens can transmit more light than it receives. Thus an *f*:2.4 lens which transmits 80% of the light it intercepts within normal working angles is rated as *T*:3.

$$\frac{2.4}{0.80} = 3$$

The concept of *f*-numbers is extremely simple in the case of single-element lenses. As we said, this number is found by dividing the focal length of the lens by its clear diameter. If a lens of 6 inches focus has a diameter of 3 inches, its speed is *f*:2.

$$\frac{6}{3} = 2$$

Calculation of *f*-speeds is very complex in the case of compound lenses, as the focal lengths and diameters of the individual lens-elements cannot be considered separately without taking into account the distances separating them and even their thicknesses! *This is why neither the f-number nor any so-called "light-collecting speed" can be specified on the basis of the diameter and working distance from the aperture of the rear element alone.*

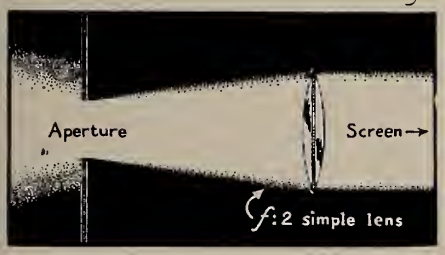
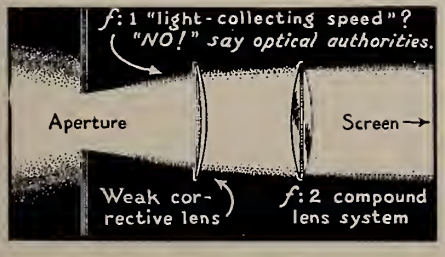


FIG. 1. Interpasitian af a rear element for impraved image definitian daes not necessarily effect the speed (f-rating) af a projection lens. The term "light-callecting speed" for the rear element alone is misleading. All elements af a campaund lens wark together and must be considered as a unit. The upper half of this illustration is referred ta in the accampanying article as 1A, and the lawer half as 1B.



Purpose of Rear Element

We can make the matter clearer. Take a simple biconvex lens, such as the one shown in Fig. 1A. This is drawn to scale to have a speed of *f*:2. Now suppose that the image on the screen is somewhat distorted with this lens. To correct these distortions we interpose a weak meniscus lens between the first lens and the film aperture, as in Fig. 1B.

We now have a compound (2-element) lens: the biconvex lens is the "front element" and the meniscus lens is the "rear element." And it happens that the rear element is so near to the aperture that, *if it did all the work of forming an image on the screen,* it would have a speed of *f*:1. Actually, however, our meniscus lens is very weak and does little refractive work other than "correcting" the action of the biconvex front element. To specify this lens as having a "light-collecting speed" of *f*:1 would be scientifically false.

True, the rear elements of real lenses actually perform a great deal of the image-forming work, but not all nor even half of it. The closer to the aperture they are, the less work they usually do; and they must also function in conjunction with a number of other lens-elements, *one of which* (in the case of a certain modern lens) *is sufficiently concave to counteract the positive refraction of the rear element to a large extent as regards image-formation on the screen!* In such a case the front element does most of the work.

Geometric speed (*f*-ratings), transmission efficiency (either as percent transmission or as a *T*-number rating), and actual performance on the screen are by far the most important things for the projectionist to think about in connection with lenses. An *f*:2 lens which is said to have an *f*:1 light-collecting speed is likely to be no faster and no more "light-gathering" in my opinion than any other *f*:2 lens.

Furthermore, the *f*-rating required of the projection lens for the brightest, most uniformly illuminated pictures depends upon the optical speed of the lamp optical system. This is not to say that the *f*-ratings of projection lens and lamp mirror or condenser should be the same (the lens should have a faster *f*-rating to match a mirror of given speed).

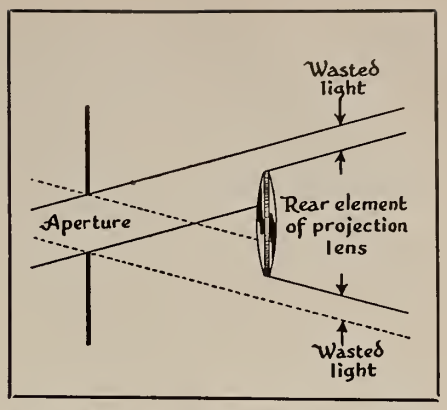


FIG. 2. Rays af light passing clase ta edges af aperture fram appasite edge-zanes af large ("fast") mirrar avershoot a lens which is taa small ("slaw") to match the mirror aptically. Result: vignetting and hot spot. Mast projectian lenses, hawever, are undersize in relatian ta madern, fast lamp aptics, making this diagram indicative af actual conditions.

The geometric speed of any lamp mirror or condenser is an *f*-number obtained by dividing the working distance by the diameter of the component. Thus a 16-inch mirror positioned 32 inches from the aperture has a virtual speed of *f*:2.

$$\frac{32}{16} = 2$$

Now, the speed of projection lens required to match any mirror or condenser does not depend *directly* upon the *f*-rating of the mirror or condenser, but rather upon a complex geometric relationship in which the E. F. (equivalent focal length) of the projection lens and the diagonal of the aperture are among the included factors. To spare the reader a long and difficult discussion, we shall only print the formula which gives the *f*-number of the lens needed to match the lamp optics.

$$f = \frac{Fm}{bF + a(F + m)}$$

In this formula a is the aperture-diagonal (1 inch), b is the diameter of the mirror or condenser, F is the E.F. of the projection lens, and m is the distance of the mirror or condenser to the aperture—all expressed in inches.*

It should be kept in mind that, when projection lens and lamp optics are *perfectly* matched, the projection lens intercepts and utilizes *all* of the light emerging from the aperture, lens absorption and reflection not being considered.

The above formula, while absolutely correct for single-element projection lenses, is also extremely accurate for actual lenses consisting of several lens-

*A complete explanatian of this formula and its mathematical derivatian may be faund in the Octaber 1949 issue of IP, beginning under the heading "The Efficiency Ratio" on page 8.

elements mounted in a tube. It proves beyond doubt that projection lenses must be even faster than the most rapid of available lenses to match perfectly modern high-speed mirrors.

In general, therefore, projection lenses are somewhat undersize in relation to the speed of the lamp optics. What happens when the lens is too small in diameter to match the lamp mirror? As Fig. 2 shows very clearly, many of the rays of light passing through the aperture *close by the edges of the aperture* miss the lens entirely (or, if picked up by the rear lens-element, they fall upon the inner surface of the lens tube and never reach the screen).

Reason for Hotspot

Light is wasted by the undersize lens, that much is clear. Something else equally important is also clear. *The wasted light consists of rays which pass through the aperture close to its edges.* As a result, the edge-areas of the projected picture on the screen are less bright than the middle areas. The relatively brighter middle area is called a "hot spot," while the fadeaway of light at the edges is called "vignetting."

Now let's make our lenses bigger—so big that they pick up *all* of the light coming through the aperture and are perfectly matched to the lamp mirror. This expedient, so easy in imagination, is difficult in practice because many projector mechanisms will not take bigger lenses. Fortunately, for the purpose of discussion, we can establish the same condition of perfect optical match by reducing the diameter of the mirror.

We shall use a smaller lamp mirror. What happens to the vignetting effect now? As Fig. 3 demonstrates, it disappears because all the edge-rays are collected and *sent to the screen* by the lens. The hot spot is gone, and the picture, although not so bright as formerly, is more evenly illuminated.

As mentioned before, the projection lens is a bit too "slow," too small, to match the lamp optics in the great majority of actual cases. Should the reverse condition prevail, however,—the lens being larger than necessary—picture quality on the screen is not affected in any way. It looks just as it does when lens and lamp optics are perfectly matched to one another.

In a case where the lens is actually oversize, all light coming through the aperture is intercepted by the lens; and because the cone of light has the smaller size, the lens is automatically "stopped down," as photographers say. There will be a slight improvement in the depth-of-focus characteristics of the lens, and a possible slight increase in the clarity of the picture. The outer zones of many lenses usually do not function

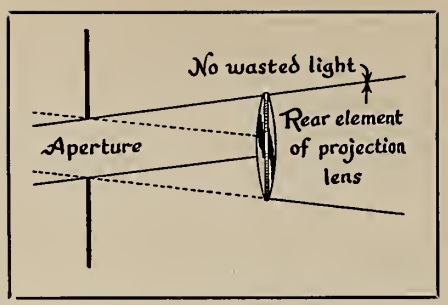


FIG. 3. Reducing the diameter of the mirror reduces total illumination, but it also establishes a condition of optical match with the projection lens. Note that the angles formed by the light-rays are smaller than in Fig. 2. Also note that the lens picks up all of the edge-rays, providing uniform illumination on the screen.

quite as well as the middle zones; and when all the light goes through the middle zones, a clearer image on the screen may be expected. The picture will be considerably less bright, however.

Now even though the biggest lamp mirrors and condensers are somewhat too fast to permit perfect matching with the projection lens—speeds of from *f*:2.0 to *f*:1.5 in the case of most modern lenses—are we to assume that the average projector optical system is unsatisfactory? By no means!

Edge Zones Are Dim

As a matter of fact, the edge zones of the cone of light emerging from the projector aperture are not nearly so bright as the central rays. If the lens fails to pick up and send to the screen all of the outermost rays, the actual loss of light is *very much smaller* than or purely geometric considerations would have us believe. Consequently, vignetting and hot-spot effects are not appreciable with even the biggest and most powerful lamp mirrors.**

The quality of motion-picture projection has improved vastly since the advent of more powerful arc-lamps and faster, coated lenses of advanced design. Projectionists need have no fear of using lamps with the largest-sized mirrors or condensing lenses, and, naturally, the most rapid projection lenses should be used in conjunction with them.

Modern American projection lenses have no peers. Certain foreign lenses may be as good as American lenses, but none is better than, for example, the Snaplite and Super Snaplite lenses of unsurpassed quality made by Kollmorgen, the excellent Hilux and revolutionary Super Hilux series produced by Projection Optics, the well-known and admirable Cinephor and Super Cinephor lenses manufactured by Bausch & Lomb, and the superb Cinema Raptars made by Wollensak. The speeds (light-collecting *powers*) of all these admirable lenses are rated by *f*-numbers.

****Projectionists must guard against vignetting effects caused by shading of the projected beam of light by the front part of the lens-holder or by the hole in the front of the mechanism case when short-focus lenses are used. When such shading does occur, reducing illumination of the edge-areas of the screen image, specially designed lenses are required.**

TESMA Show to Spotlight New Equipment

A close-up view of the VistaVision horizontal projector will be one of the features of the combined convention of the Theatre Equipment and Supply Manufacturers Association and the Allied States exhibitor group, opening on November 6 at the Morrison Hotel in Chicago.

In addition, a double-frame VistaVision print of a forthcoming Paramount feature will be shown at the State Lake Theatre for those attending the convention. A horizontal projector will be on display at the Century Projector Corp. booth on the convention floor.

If the equipment is ready in time for the show, there will also be a display of the new CineMiracle process. This system is similar to Cinerama except that it is operated by means of three projectors located in one projection booth rather than at different points in a theatre. Also on display will be a portable wide-screen Tv projector capable of producing a 20-foot-wide picture. It can be plugged into a 120-volt circuit.

A theatre equipment and new-processes forum, to be headed by Larry Davee, of the Century Projector Corp., will be another important event at the convention.

A partial list of the theatre equipment manufacturers who will exhibit at the convention is as follows: Altec Lansing Corp., Ampex Corp., C. S. Ashcraft Mfg. Corp., Automatic Devices, Ballantyne Co., Bausch & Lomb., Century Projector Corp., Continental Electric Corp., DAWO Corp., Drive-in Theatre Mfg. Co., Eprad Corp., Walter Futter Co., Goldberg Bros., Gordos Corp., Heyer-Schultz Co., International Projector Corp., Kneisley Electric Co., Kollmorgen Optical Co., LaVezzi Machine Works, Lorraine Carbons, Motiograph, Inc., National Carbon Co., National Theatre Supply, Neumade Products Corp., Norpat Sales, Paromel Electronics Corp., Projection Optics, Radiant Mfg. Co., Radio Corp. of America, J. E. Robin Co., Raytone Screen Corp., Strong Electric Corp., Superior Electric Co., Wenzel Projector Corp. and Wollensak Optical Co.

LETTERS TO THE EDITOR

The Focusing Problem

To the Editor of IP:

I consider it just about impossible to focus present-day film and would like to add my emphatic support to the Monthly Chat and the letter by Robert A. Mitchel which appeared in the August issue of IP.

The lens mounts on our projectors are marked, and the focus is written down when we run a picture. This works out fine until you run the picture a second time. The old setting turns out to be useless. You need a different one.

Comes the end of the reel, the second lamp is lit with a slight increase in amperage—the focus changes again. A splice that comes through with a little difference in focus can make it necessary for you to refocus.

On top of that we have constant drifting of the film in and out of focus. Try to keep a picture sharp under these conditions. Mostly, our prints are new, but they still weave in and out of focus. When we run a slightly used, warped print, the situation is hopeless.

Each run of a picture, with the differences in density of the film between indoor and outdoor scenes, make this warping worse. I'd like to see this fellow, Connor, who wrote the complaining letter published in your August issue, find some way to keep up with conditions like these.

P. A. WILLS

Decatur, Ill.

EDITOR'S COMMENT: Here we go again! It's probably obvious to most projectionists by now that the precision of a great deal of equipment now in projection rooms, and most of the camera and laboratory equipment being used in Hollywood is not up to the demands made by the tremendous magnification of the film image on big, wide screens.

The projectionist is forced to take a tiny film image, not sharp enough to start with, and project it at high amperages which are almost certain to buckle the film and keep it flapping in and out of focus. Plus that, he is stuck with the shallow depth-of-focus of the short-focus lenses which the wide screen makes necessary.

Presently available aids in coping with the focus problem concentrate on reducing heat. They include heat filters, water-cooled gates, air blowers, and air jets blasted at the film as it goes by the aperture. None of these alone are a complete or final answer to the problem. The closest thing to an answer has to come from the projectionist himself. He has to keep focusing, focusing all the time—and that's not so easy when you think of his other duties. Conscientious projectionists should be complimented on the patience now required to get anything like a good picture on the screen in a great many theatres.

Understandable Confusion

To the Editor of IP:

I have read several articles in IP and in other magazines on the new Todd-AO process. Some of these say that the Todd process will be made on 65-mm film, and others say that it will be made on 70-mm film. I would appreciate it if you could give the correct information on this matter.

THORNTON MORTENSEN

San Bernardino, Calif.

EDITOR'S REPLY: The reason for your confusion on this point is that you may not have read the articles in question closely enough. However, the subject is, by its very nature, confusing. Both 65-mm and 70-mm film are used in the Todd AO process; 65-mm is used in the camera and 70-mm prints are made for theatre projection. The size of the film image remains the same on the print, but the print has extra area to hold the numerous sound tracks used in the Todd-AO stereophonic sound setup.

More on the Jackson Intermittent

Last month IP carried a most interesting letter from Jose M. Ruiz, of Santa Clara, Cuba, commenting on the article, "A 60-Degree Intermittent Movement," by J. G. Jackson, of Vancouver, Canada, which was published in our February issue. The story concerned an oscillating-cam geneva movement designed to provide the extremely fast pulldown ratio of 5 to 1, thereby making possible practically flickerless projection.

For the benefit of these projectionists interested in projector design ideas, we add the following comment on Mr. Ruiz's letter by J. G. Jackson and by IP.

To the Editor of IP:

Mr. Ruiz's letter was most welcome in furthering the discussion of this intriguing subject. He believes this intermittent to be rather complex for projection. It appears that the American manufacturers tend to agree with him purely from a cost viewpoint. They do not deny its advantages from a mechanical standpoint, but they do not think the advantages warrant the added cost of this equipment.

About IP's comment on the application to 16-mm: During years of research, I gave serious thought to this application and have notes and drawings relating to it. I considered, as does Mr. Ruiz, that the 4-tooth sprocket was too small to be practical. I considered also the use of a 6-tooth as well as an 8-tooth sprocket, but the calculations proved that the movement speed obtained with the extra star slots was too slow.

With an 8-slot star, the resultant speed would not be 135 degrees, as Mrs. Ruiz points out, but works out to the equivalent of a 90-degree movement due to the extra cam speed. The resultant speed is two-thirds of the star to cam ratio, hence two-thirds of 135 is 90. As in my specifications two-thirds of 90 is 60, hence the 60-degree movement.

My notes suggested the use of 2-1 reduction gears between star and sprocket as suggested by Mr. Ruiz. In this case there probably would be some back-lash between gears and I suggested the use of a spring damping device to eliminate this fault. A spring damping unit is used by General Precision in their 16-mm projector to stop back lash in the sprocket. They do not use a geneva movement, but they do use a damping unit. I refer to an article by G. T. Lorance in the Journal of the SMPTE, February, 1950. IP is correct in stating that this movement is adaptable to 16-mm. However, I must admit that extra gearing adds still further to the manufactured cost.

About the eccentric star intermittent. First I would like to refer to two excellent articles which were printed on intermittent movements in 1950. The first was in IP for March 1950, by A. C. Schroeder, and the second in the Ideal Kinema (England), April 1950 by R. Howard Cricks. Both of these learned gentlemen pointed out that the cam pin must enter the star slot tangentially and leave the same way to avoid knocking against the side of the slot. A star that employs non-radical slots cannot avoid this fault. It appears that the eccentric star intermittent was of this nature.

J. G. JACKSON

Vancouver, B.C., Canada

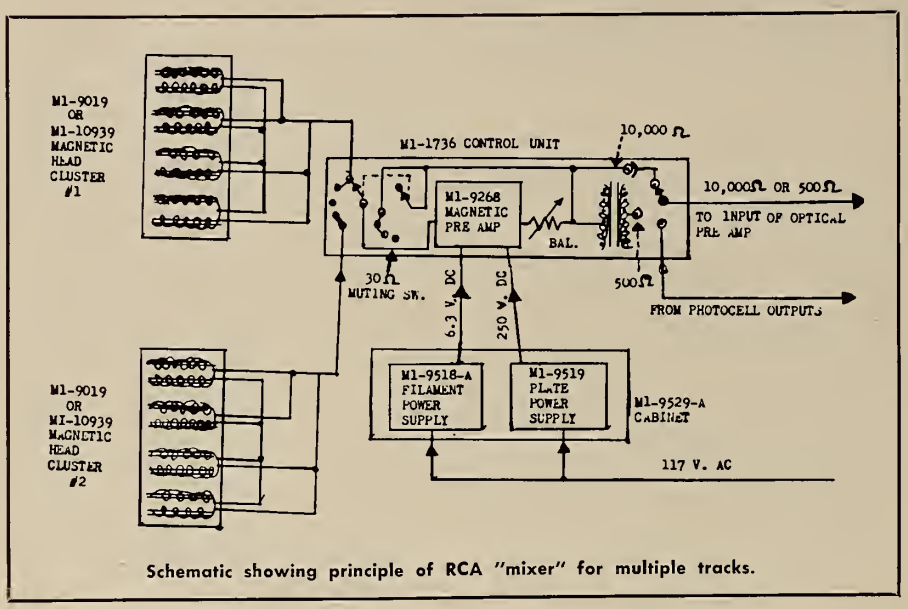
EDITOR'S COMMENT: Mr. Ruiz's remarks are both intelligent and constructive. A 4-tooth intermittent sprocket for 16-mm projectors is certainly much too small for efficient transport of the film.

Our opinion is that the Jackson movement would lend itself admirably to the 8-slotted star suggested by Mr. Ruiz. With the oscillations timed to effect engagement of the cam pin with the slots once every two revolutions of the cam, the 135-degree star-and-cam system would have an effective pulldown of 67½ degrees—a pulldown ratio of 4-1/3 to 1.

Use of cam accelerators also results in serviceable rapid-pulldown geneva movements when starwheels having more than 4 slots are involved. The interposition of reduction gears between the

(Continued on page 27)

RCA Providing 'Mixer' for Magnetic Sound



Schematic showing principle of RCA "mixer" for multiple tracks.

ONE of the largest and newest drive-ins to be erected on the West Coast, "The Big Sky," at Chula Vista, Calif., was recently equipped with an RCA sound system that provides for the mixing of the four CinemaScope magnetic tracks into a single sound channel for broadcast over approximately 2,000 speakers when the theatre is filled to capacity.

Reproducers of this type are now being installed at many drive-ins that desire to take advantage of the quality and greater availability of magnetic CinemaScope prints. They are also attracting considerable interest from indoor theatre owners who wish to use the magnetic prints, but are reluctant to spend the money required for a complete 4-channel installation.

The "mixer" section of the RCA sound system installed at "The Big Sky" is best described in the rough schematic accompanying this article. The illustration shows the PG-932 adaption kit for use with existing optical reproduction systems.

Stereo System Available

The PG-932 has facilities for mounting only one magnetic preamplifier and is for use where there is no intention to later expand into full stereophonic sound with four complete amplifier and loudspeaker channels. Another unit, the PG-391-A can mount up to four magnetic preamplifiers and is intended for those installations which may later desire to expand into a full stereophonic system.

The principle on which the adapter kit works is simple. As can be seen from the schematic, it is necessary only to series-parallel the four pickups of each magnetic head into a single preamplifier and then feed the composite signal into the existing amplifier system. While the stereophonic effect is lost in this process, the method is practical and the results are said to be surprisingly good.

The PG-392 kit consists of a 1736-B control unit which houses a two-stage magnetic preamplifier utilizing a dual triode. The combined signal is fed to the input of the magnetic preamplifier through a changeover switch located at the lower right hand side of the cabinet. An extension rod and auxiliary lever is provided for extending the changeover control to the second projector. The output of the magnetic preamplifier is muted during changeover by means of separate contactors on the changeover switch.

Power Supply

Filament and plate power for the preamplifier is supplied by the MI-9518-A filament power supply and the MI-9519 plate power supply. These two power supplies have sufficient capacity to power four MI-9268 preamplifiers.

An optical-magnetic switch located on the upper left hand side of the cabinet selects either the output of the MI-9268 preamplifier or the output of the photocell and connects it to the input of the existing sound system. A transformer is also provided in the cabinet so that the output of the MI-9268 preamplifier or the photocell may be connected to a sound system having either high or low impedance input.

The PG-391-A kit is essentially similar to the first kit except that it contains facilities for mounting extra preamplifiers for stereophonic sound whenever desired. It has a three-gang volume control, and a separate volume control for the fourth or effects track that can be used when needed.

Kodak Scientist Speeds Design of Fine Lenses

An Eastman Kodak scientist, Dr. Max Herzberger, has been credited with developing a new procedure for lens design which eliminates the need for most of the lengthy mathematical calculations usually required in the making of fine lenses for photography and projection.

This scientific shortcut is essentially a way of analyzing the optical image and considering it as a superimposition, or placing one over the other, of five simple types of images. Each of these images represents one of the five simple types of possible image errors usually found in a lens. From this relatively simple analysis, Dr. Herzberger has been able to determine the design of lenses which solve the most difficult optical problems.

Until now, lens designers, using computing machines, have laboriously traced rays of light through a lens system during the design stage. The new method reduces the job to the tracing of only nine rays, yet by applying Dr. Herzberger's mathematical formulas to this information, it becomes equivalent to the information obtained by tracing as much as 1,000 rays.

To achieve his quick and complete analysis, something sought by scientists during a century of optics research, Dr. Herzberger first learned how to classify image errors for full aperture and for an extended field. These types of errors describe the degrees of symmetry or asymmetry in the image. They also describe the amount of deviation in all directions. The method permits the designer to visualize how the errors are balanced in a given system and thus guides the designer in his aim to obtain a better lens.

The reliability of the new method was checked by use of micro-photographs of tiny points of light as affected by various degrees of the five types of error referred to above. The tremendously enlarged photos proved the accuracy of the mathematics for cancelling out and combining for the best image.

Dr. Herzberger has long been known for his studies in geometrical optics and related research. In the 1920's and early 30's he held important design posts with the famous Leitz and Zeiss companies in Germany. He came to America in 1935 and continued his scientific career at the Kodak Research Labatories.

OBITUARIES

HARRY EIFERT, 65, veteran member of Local 164, Milwaukee, Wis., died July 18 after a lingering illness. He joined the Milwaukee Local in April, 1912, and for the past 22 years worked in the projection room of the Oriental Theatre there. Shortly before his death, Eifert retired under the Local's pension and disability plan. Survivers are his wife, a son, his father, and three brothers. The son, Harold, is a member of Local 164.

ALBERT A. DUBIN, 65, member of Philadelphia Local 307, died recently. He held membership in Local 307 since April, 1917, and worked at the Arcadia Theatre in Philadelphia for 25 years. He served in World War. I. He is survived by his wife.

DONALD LEWIS, SR., and FLOYD A. PUMFORD, members of Detroit Local 199, succumbed to heart attacks within ten days of each other. Lewis, 60, was stricken August 3, and Pumford, 51, died on August 13.

MICHAEL J. OSTROWSKI, 74, member of Buffalo Local 233 since 1911, died July 22 last. A charter member of the Local, Mike Ostrowski was well-known in projectionist circles having worked in a number of theatres in the Buffalo area until his retirement three years ago. He served the Local in various official capacities and at the time of his death held the office of vice-president. He is survived by his wife, three sons who are also members of the Buffalo Local, three daughters, 12 grandchildren.

JOSEPH D. BASSON, 66, IA representative, died September 7 after a long illness. He started his career in the entertainment field back in 1908 when he worked as a motion picture projectionist at the Savin Rock amusement park near New Haven, Conn. During the next few years he worked at nickelodeons in New York City, where he helped organize and became the first president of Local 306, now one of the largest Locals in the Alliance.

Basson was appointed IA representative by President Walsh in 1942 and worked out of the General Office in New York City, taking an important part in negotiations on behalf of film exchange employes and front-of-the-house theatre employes throughout the country. He was also active in organizing Tv technicians.

Survivors are his wife, a daughter, and two grandchildren.

Todd AO Projectors Ready

Todd AO now has sufficient 70-mm projection equipment ready at its Southbridge, Mass., plant to equip 25 theatres. The stockpile is said to include replacement machines and spare parts. Todd AO projectors are built by the Philips company in Holland. They will be used for the first time when the film, "Oklahoma," receives its premiere in New York and Los Angeles sometime next month.

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Are You Listening?

Just What Is Sound?

Arguments generated by the current interest in high-quality sound reproduction often bring into use unfamiliar terms. Following are some definitions, provided by the American Standards Association, which explain terms that many projectionists may be hearing for the first time.

PITCH: Pitch is that attribute of auditory sensation in terms of which sounds may be ordered on a scale extending from low to high, such as a musical scale. Pitch depends primarily upon the frequency of the sound stimulus, but it also depends upon the sound *pressure* and wave-form of the stimulus.

The pitch of a sound may be described by the frequency of that simple tone, having a specified sound pressure or loudness level which seems to the average normal ear to produce the same pitch. The *mel* is a commonly used unit of pitch. It is so defined that a pitch of 1000 *mels* results from a simple tone-frequency of 1000 cycles per second, 40 db above the *normal* threshold of audibility.

LOUDNESS: Loudness is the intensity attribute of an auditory sensation, in terms of which sounds may be had on a scale extending from soft to loud. Loudness depends primarily upon the sound pressure of the stimulus; but it also depends upon the *frequency* and *wave-form* of the stimulus.

Related Sound-Pressure Values

LOUDNESS CONTOURS: Loudness contours are curves which show the related values of sound pressure level and frequency required to produce a given loudness sensation for the *typical* listener.

[NOTE: Aural acuity curve drops off with advancing age, particularly after the age of 45.]

THRESHOLD OF AUDIBILITY (Threshold of Detectability). The threshold of audibility for a specified signal is the minimum effective sound pressure of the signal that is capable of evoking an auditory sensation in one-half of a number of trials. The characteristics of the signal, the manner in which it is presented to the listener, and the point at which the sound pressure is measured *must be specified.*

NORMAL THRESHOLD OF AUDIBILITY: The normal threshold of audibility at a given frequency is the model value of the minimum sound pressures at entrance to the ear canal which produce an auditory sensation in a large number of *normal* ears of individuals between 18 and 30 years of age.

THRESHOLD OF FEELING (Or Discomfort, Tickle, or Pain): The threshold of feeling (or discomfort, tickle, or pain) for a specified signal is the minimum effective sound pressure of that signal which (in one-half of the number of tests) will stimulate the ear to a point at which there is the sensation of feeling (or discomfort, tickle, or pain). Characteristics of the signal and the measuring technique *must be specified in every case.*

HEARING: The per cent hearing at any given frequency is 100 minus the per cent hearing loss at that frequency.

ARTICULATION AND INTELLIGIBILITY: "Per cent articulation" or "per cent intelligibility" is the percentage of the speech units spoken by a talker or talkers that are understood *correctly* by a listener or listeners.

NOTE: The "per cent articulation" or "per cent intelligibility" is a property of the entire communication system: talker, transmission equipment or medium, and listener. Even when attention is focused upon one component of the system (*e.g.*, the intelligibility of a talker, the articulation of a radio receiver) the other components of the system should be specified.

INSTANTANEOUS SPEECH POWER: The instantaneous speech power is the rate at which sound energy is being radiated by a speech source at any given instant.

NORMAL THRESHOLD OF FEELING: The normal threshold of feeling is the accepted value of the threshold of tickle based on measurements on a large number of *normal* ears of individuals between 18 and 30 years of age.

Auditory-Sensation Area

A. Auditory sensation area is the region enclosed by the curves defining the threshold of feeling and the threshold of audibility as functions of frequency.

B. Auditory sensation area is the part of the brain (temporal lobe of the cortex) which is responsive to auditory stimuli (sound).

LEVEL ABOVE THRESHOLD (Sensation Level): The level above threshold of a sound is the pressure level of the sound in decibels above its threshold of hearing for the individual observer.

AIR-CONDUCTION: Air conduction is the process by which sound is conducted through the air in the outer ear canal.

BONE-CONDUCTION: Bone-conduction is the process by which sound is conducted to the inner ear through the cranial bones.

HEARING LOSS (Deafness): The hearing loss of an ear at a specified frequency is the ratio, expressed in decibels, of the threshold of hearing for that ear to the normal threshold.

AVERAGE SPEECH POWER: The average speech power for any given time interval is the average value of the instantaneous speech power over that interval.

Music Terminology

TONE: *A.* A tone is a sound-sensation having pitch. *B.* A tone is a sound-wave capable of exciting an auditory-sensation having pitch. *C.* A tone is a larger successive interval in a major scale.

SIMPLE TONE: *A.* A simple tone is a sound-sensation characterized by its *singleness* of pitch. *B.* A simple tone is a sound-wave, the instantaneous sound pressure of which is a simple sinusoidal function of the time.

COMPLEX TONE: *A.* A complex tone is a sound-sensation characterized by *more than one pitch. B.* A complex tone is a sound-wave produced by the combination of simple sinusoidal components of *different* frequencies.

FUNDAMENTAL TONE: *A.* The fundamental tone is the component tone of lowest pitch in a complex tone. *B.* The fundamental tone is the component of lowest frequency in a complex tone.

OVERTONE: *A.* An overtone is a component of a complex tone having a pitch higher than that of the fundamental pitch. *B.* An overtone is a physical component of a complex sound having a frequency *higher* than that of the basic frequency.

PERSONAL NOTES

J. A. CHILDS, for many years a sound engineering expert with the Altec Service Corp., has been appointed technical supervisor for Todd-AO. Childs now divides his time between the Motion Picture Products Division of the American Optical Co., in Southbridge, Mass., and the Rivoli Theatre in New York City, where he is supervising the installation of the projection and sound equipment for the premiere next month of the film, "Oklahoma," in the Todd-AO process.

* * *

WALLACE BUCHER has been appointed sales promotion manager of the Radiant Mfg. Corp., Chicago, manufacturer of screens for motion picture theatres.

Also appointed by Radiant are GEORGE BAUMANN, as advertising manager and



New Radiant Screen execs: Left to right, Wallace Bucher, George Baumann, and Merrill Natker.

MERRILL NATKER, as assistant advertising manager. Baumann was formerly advertising manager of the Autopoint Co., a division of the Cory Corp., Chicago, and Natker was formerly an advertising agency account representative.

* * *

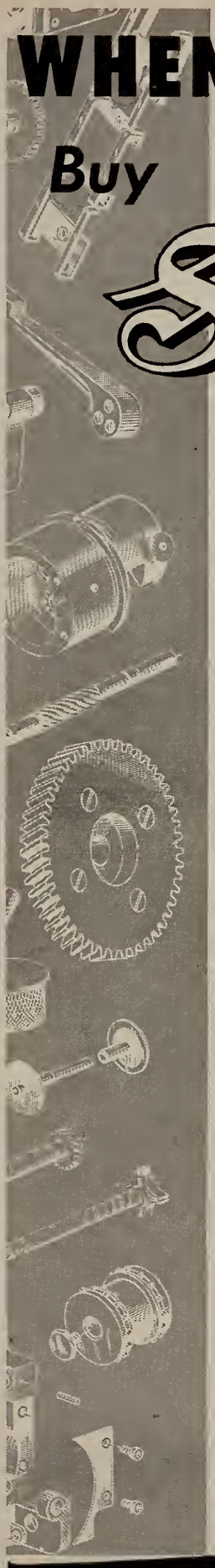
E. S. GREGG, president of the Westrex Corp., is back in New York after visiting company offices in Japan, Philippines, Hong Kong, Thailand, Indonesia, Singapore, Ceylon, India, Pakistan, Italy, and France. He also visited Afghanistan, Turkey and Greece, and presided over a conference of subsidiary company managers held May 30 in Bangkok.

LETTERS TO THE EDITOR

(Continued from page 23)

star and sprocket shafts is not too popular with many engineers, however, because of the likelihood of introducing registration errors.

Mr. Ruiz's remarkably thorough knowledge of a wide variety of projectors is evident from his letter. The Philips EL-5000 soundfilm projector, however, employs a grooved disk movement and a 12-tooth intermittent sprocket. This movement is very reliable and quiet in operation, and it combines the sturdiness and long life of the geneva movement with the accuracy and short-shift period (5 to 1 ratio) of the claw movement.



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SMPTE LAKE PLACID MEET

The continually increasing importance of color motion pictures will be the theme of the 78th Convention of the Society of Motion Picture and Television Engineers, to be held at the Lake Placid Club, Essex County, New York, from October 3 to 7.

The program committee has arranged for ten or more technical sessions dealing with color materials and their uses, high-speed photography and educational Tv. In order that those attending may hear diverse opinions on these subjects, five of the technical sessions will be conducted as panel discussions or symposia.

One of these panel discussions will be on the large screen. It will cover mechanical design, subtended screen angle, picture information, and optics of projection.

The annual awards session will be held on Tuesday; October 4. Winners of the Society's Progress, Sarnoff, Warner and Journal awards for 1955 will be introduced and presented with medals and citations.

$3.60 Top for "Oklahoma"

Todd-AO is following the lead of Cinerama in setting steep admission prices. A ticket to "Oklahoma," when it opens next month at New York's Rivoli Theatre, will cost $3.60 on evenings and weekends. The $3.60 top is standard for Cinerama in New York.

IN THE SPOTLIGHT

(Continued from page 19)

elected vice-president and member of the executive board.

Although he is only 53 years old, Moran has been a member of the IA for the past 31 years. He was elected a trustee of Local 86 in January 1925, and in 1926 served as vice-president. In 1927 he was elected president of the Local, a post he held for the next 12 years. He was financial-secretary and treasurer from 1940 to 1944, and since 1945 Moran has served in his present office as secretary and business representative of Local 86. He has represented his Local at IA conventions for the past six years and was elected a delegate to the 1956—convention.

Moran's latest assignment is his appointment to the public relations committee of the Burbank Hospital in Fitchburg. While serving on this committee, he was instrumental in reducing the hours for nurses and office employes from 44 to 40 hours per week with no reduction in pay. A feather in Moran's cap is his recent election as an incorporator of the Fitchburg Savings Bank, no mean achievement for a union man.

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TECHNICIANS TAKE OVER

(Continued from page 17)

that *everything* audible is finished. Dramatic reality is given life, balance between dialogue and music is established and even voice quality is changed when deemed necessary in order to be more pleasant, or better suited to a particular characterization.

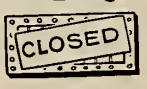
The amount of complex equipment that goes into this process is staggering. Great batteries of re-recording machines and recorders roll in a room adjacent to the stage. On the huge console panel the sound mixers use a myriad of controls, from a wonderful device called a graphic equalizer that makes balance easily *visible* as well as audible, to the three controls that follow the stereophonic voices, and the controls for the fourth or surround track. No detail is overlooked or passed over; perfection is the only standard these men will settle for.

The final recordings are made on the three stereophonic tracks and then the whole is run again and it is decided what is to go on the fourth track. This done, the final four-track recordings are made.

When both the picture and the four-track sound are finished, the next thing that is done is to manufacture a "protective master" (the negative has been cut to match the positive and protective master made by the optical department). This is kept at the studio and the picture negative sent to Deluxe Lab in New York where an answer print is made and immediately shipped to the studio. Here it is striped for magnetic sound by Henry Goldfarb and his crew at the studio's Western Avenue Lab and sound printed. This finished print is run for Mr. Zanuck, the producer and the director. Their final OK sets the New York lab in motion making release prints, and within two weeks the picture is in the theatres.

for want of an Altec service man,  the sound was lost

for want of sound,  the show was lost

for want of a show, 

the audience was lost

for want of an audience, the receipts  were lost



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BOOK REVIEW

THEORY OF LENSES, by E. W. H. Selwyn, *The Institute of Physics*, 47 Belgrave Square, London, S. W. I., 62 *pages*—5 Shillings.

This compact little book is one of a series intended for general reading by students of physics on a college level. It manages to compress a great deal of information into a small space, and also has the added virtue of using a minimum of mathematics and a great deal of illustration. It is divided into four chapters concerned with the basic theory of light and lenses, and with methods of solving the various problems created by color distortion and aberrations. It is recommended to those who already have some knowledge of optics and math, and desire a compact yet reasonably thorough source of advanced information.

ANAMORPHOTIC SYSTEMS

(Continued from page 15)

similar principle to the cylindrical system.

The collective lens is replaced by a collective concave mirror and the dispersive lens by a dispersive convex mirror. The conditions of focal lengths and separation of components are the same as for lens systems, but the obstruction of one mirror by the other has to be avoided by inclining the mirror surfaces at 45° to the projector axis in the vertical plane. This vertical displacement of the emerging beam introduces mechanical difficulties in some projectors, especially when using short focal length lenses.

The correction of aberration is achieved by the use of mirror surfaces whose sections are not circular. This presents further difficulties in the design and manufacture of mirror systems. This system is just as incapable of providing, in any practicable form, variable expansion ratio as the cylindrical type.

On the question of restoring distortion due to curved screens and projector angle, that applies to all anamorphotic systems. The inclination of the anamorphotic attachment with respect to the axis of the lens does have the effect of curving horizontal lines on the screen, but it is only an *approximate* correction, and other errors are still present.

MR. GUNN: Assuming one has the best optical equipment available, and leaving aside any desire to imitate Cinerama, for example, and questions of screen reflectancy, is there anything to be said in favor of using the curved screen, *purely from the optical point of view?*

MR. COOK: The only thing in its favor is the polar curve of reflection from the screen. We have had a spasm of 3-D projection which has required the use of metallic screens with high reflectivity. The difficulty is that if you have a flat screen with

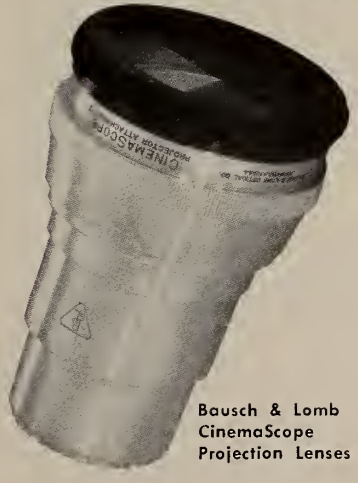


Clark Gable and Jane Russell in "The Tall Men," 20th Century-Fax CinemaScope praductian.



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a wide-angle anamorphic projection, the polar curve at the edge of the screen is reflected away from the auditorium, and viewers on the opposite side of the theatre will see a poorly illuminated picture. By choosing a suitable screen curvature, the same polar curve from the same screen material can be reflected back in the desired direction.

Apart from that consideration, *there is no advantage in the use of curved screens, from an optical point of view.*

MR. HIGGINS: I have looked up "anamorph" in Webster's dictionary. The word does not appear there, but the definition of anamorphosis is "a distorted or monstrous projection of representation of an image."

Cylindrical Lens Advantage

Mr. Cook has pointed out the advantages of the prismatic anamorph, but we have all seen in the trade press accounts of trials in which it seems to be a general verdict that the cylindrical has certain advantages over the prismatic. Will Mr. Cook kindly enlarge on this?

MR. COOK: I think what you have seen this evening should enable you to judge whether, from the point of view of definitions, there is any difference between prismatic and cylindrical systems. There are, however, one or two purely mechanical considerations which arise in rather unusual cases, under extreme conditions of screen sizes and projection distances.

Where very short focal length lenses are required, the projection lens is sunk right down into the body of the projector, and unless the anamorphotic attachment is positioned closely to it, the amount of oblique light passing through the attachment will be greatly reduced, and there will be a fall in illumination at the sides of the screen. In this application, the cylindrical type has the advantage that it can go down into the body of the projector.

The second advantage lies in the fact that cylindrical attachments can be made in the larger sizes demanded by wide-beam diameters emerging from projection lenses of extremely long focal length and wide relative aperture. This is an unusual type of condition arising, for example, in Drive-In theatres, and the volume of glass and its cost in a comparable prismatic attachment is quite prohibitive.

Light Transmission Similar

MR. BLAND: Mr. Cook was speaking about the added requirements by way of performance of the projection lens which brought up the added distortion shown by the anamorphotic lens system. The performance of the new lens was improved, but it did seem to me that there was a loss in luminance, and the screen brightness did not seem so great. Is that possibly because there are more glasses in it, the number of glass-air surfaces causing the trouble?

MR. COOK: There might be a very slight difference, but it is very difficult to keep these two projectors running at a constant brightness, and I think the loss of luminance you noticed might be due to projection conditions. Laboratory tests indicate that the light transmission through the two types is very similar.

MR. BLAND: On the question of the reflecting screen, I have always had the impression that when one went to CinemaScope proportion in large theatres, the trouble was to find enough light. One is forced to use a reflecting type of screen, and therefore a curved screen is essential. Apart from this consideration, would you say that the image is better on a flat or curved screen?

MR. COOK: From the optical point of view, the flat screen is ideal, but on the other hand the screen has to be curved very considerably before definition troubles become apparent.

MR. CRICKS: Would an answer be to curve the projector gate?

MR. COOK: There might be a case for a curved projector gate. There, one must consider two types of curvature, spherical or cylindrical. From the optical point of view, the spherical curvature would be the easier to deal with, but it would require special projection equipment. I would not like to say that any existing equipment would act in that way.

The cylindrical curvature is very difficult to deal with in normal spherical lens systems. It is possible that some useful answer might result from experimentation, but it is problematical whether or not it would be worth while attempting.

MR. LEEVERS: Mr. Cook in his calculations comparing the light efficiency of the mask gate and the anamorphotic system, referred to lens efficiency of 70% for the prismatic anamorph. Can he perhaps give us the equivalent figure for the cylindrical type?

MR. COOK: I cannot tell you the figure off-hand, but by the nature of the construction the transmission is a little better. I doubt whether this difference would ever be noticeable under conditions existing in normal projection rooms.

Theatre Conditions "Appalling"

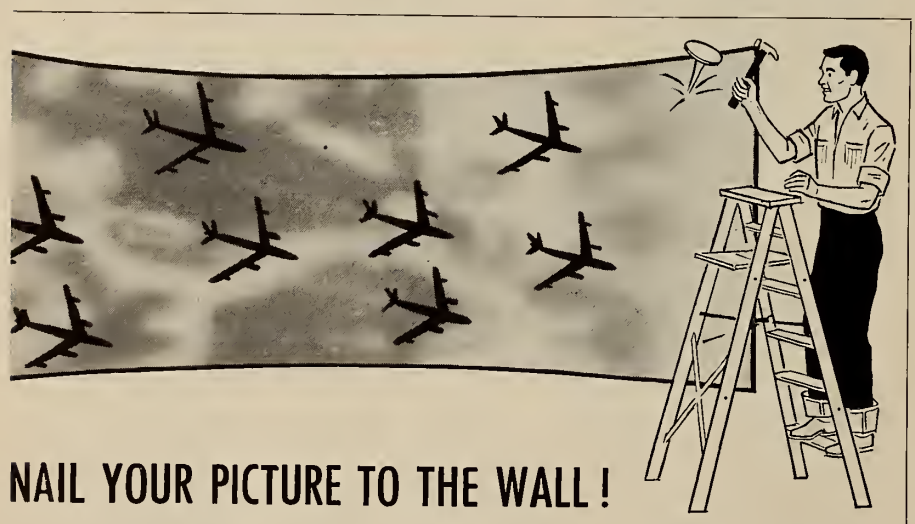
MR. GUNN: Can you touch briefly on the effect of the projection beam not being normal to the screen and what effect this has?

MR. COOK: I am appaled at conditions in some theatres. Assuming a projector axis inclined at 25° to the horizontal and the lens system focused in the centre of the screen, the top and bottom of a 20-ft. high screen is displaced from the ideal plane of best focus by about 4 feet. Furthermore, the geometry of the image is distorted by change of aspect ratio and keystone distortions.

MR. CRICKS: There is a German projector, necessitating tilting, which is claimed to be suitable for wide screen.

MR. COOK: The correction of keystone distortion is possible by an appropriate relationship between the inclinations of the projector and projection lens axes. Since this is achieved at the expense of focusing considerations for all parts of the screen and fails to correct curvature of straight lines, it is likely that the projector referred to includes tilted anamorphotic attachments.

[THE END]



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STEREOSOUND SYSTEM

(Continued from page 14)

reproducer, using material recorded from a previous selection. The center speaker output then seemed to be much louder than that of the binaural system, and would almost drown out the left and right speakers. By reverting to the "normal" operation as a delay mechanism, the center speaker's output became almost unnoticeable, even though its sound level was greater than the combined levels of the left and right speakers.

The greatest usefulness for this proposal would seem to be in motion-picture theatres, in which centrally located speaker systems of adequate power capacity already exist. To add a 2-channel stereophonic would mean adding two loudspeakers (right and left) of smaller power-handling capacity, and a method of delay for the signal to be radiated from the center loudspeaker.

If, for example, the motion-picture film uses two soundtracks for the two channels, side by side, then a sound pickup unit could contain the two photocells for the right and left tracks, and a third photocell, which scanned both tracks, spaced sufficiently far behind the other two to provide the required delay. If a standard soundtrack were played, the third photocell would act as the regular sound pickup means, and the right and left speakers would not change the illusion that the sound was centrally located as in an ordinary system.

2 out of 3 Families Have Tv

Two out of three American households now have at least one Tv set, the Bureau of the Census reports. 32,000,000 households own one or more receivers.

DISNEYLAND PROJECTION

(Continued from page 11)

When the fresh bulb, which has been in the rear of the housing, makes contact, the relay snaps back to its original position, and the blacked-out section of the picture returns to the screen. The entire action takes less than two seconds.

4-Channel Magnetic Sound

Sound for Circarama is recorded on four magnetic channels, but it is not synchronized to the projectors as this is not necessary in the travelogue type of presentation. The sound is carried to speakers mounted beneath each projector. It is possible to fill the little theatre with sound from all the speakers or to give the sound an added directional quality through selective use of the speakers. The sound reproducer was manufactured by Kinovox, and installation and servicing has been handled by Altec.

The approximate focal length of the lenses used for Circarama is 1⅜ inches, but some leeway is needed in focal length to adjust the images exactly in relation to each other and

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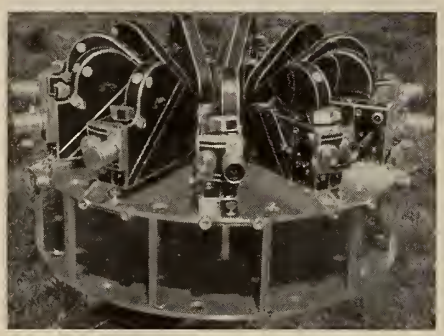
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for CinemaScope

the individual screens. This leeway is obtained by using variable-focus "Expanso" lenses manufactured by the Pacific Optical Co.

The camera system for shooting the Circarama show presented fewer problems than the projection system. Eleven of the Cine Kodak 16-mm



The Circarama cameras are shown above maunted on a platfarm sa that each of the eleven cameras cavers ane segment af a complete circle. Mast af the shats were taken with the abave rig fastened ta the tap af an automobile.

cameras were mounted on a turntable so as to point in all directions and then synchronized to each other. The cameras were activated by eleven separate drive shafts linked together in sync by means of a sprocket chain.

Most of the sequences were photographed at 24 frames per second, but one special scene was photographed at eight frames per second to give the illusion of speeding down Willshire Boulevard in Los Angeles at 90 miles per hour. The sequences were usually photographed with the turntable rig fastened securely to the top of a station wagon. All sequences were shot on Commercial Kodachrome film.

"Trip to the Moon"

Another Disneyland feature that makes imaginative use of motion pictures and special sound effects is the "Trip to the Moon," sponsored by Transworld Airlines. After being "briefed" for 15 minutes in another small theatre by means of a film that describes what rocket ships and interplanetary travel will probably be like, "passengers" are conducted by a TWA hostess into a room built to resemble what experts believe the interior of a rocket ship will look like 50 years or so from now. The "trip" to the moon is accomplished by means of synchronized rear projection into two "scanners" inside the "rocket ship."

A narrator introduces himself as a TWA captain and explains that the first 42 seconds of the flight will be too noisy for conversation due to the rushing tail blast. Then he announces



Circarama's electronic nerve center. The cantrol panel at left signals autamatically when the film breaks ar a bulb burns out on any af the projectars. The cantral unit makes a camplete electranic test after each presentatian ta insure that all units are in warking arder befare it frees the mechanism for the next showing. The unit at right is the Kinevax Saund Repraducer.

that the ship has passed the speed of sound and will shortly reach a velocity of 38 miles per second.

Background sound effects provide realism. The audience hears the radio from the tower, then the sound of the "blast off," radio bearing signals and additional rocket thrusts. The "captain," acting as if all this were normal, carries on his narration of the flight.

Powerful Illusion Created

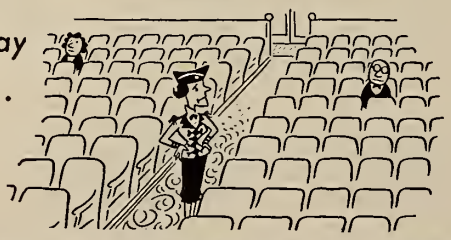
While the "passengers" feel an artifically-stimulated vibration of their seats, they watch the "scanner" in the center of the floor. This is actually a rear projection movie screen. They see the flame of the rockets and the receding Southern California coast line. Then they look up at another "scanner" above their heads to watch the space ships progress through layers of clouds and into the outer atmosphere. Through the scanners they watch the ship circle the moon and return to earth. A small plastic model of the moon, reproducing craters and other landmarks as faithfully as possible was used in filming this sequence.

A third attraction at Disneyland which makes effective use of motion pictures is a show sponsored by the Richfield Oil Co. A CinemaScope cartoon presents a capsule history of how the earth was formed billions

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of years ago and what has gone on since beneath its surface.

When the cartoon comes to a close, the houselights are automatically switched on and a recorded narration describes the second part of the presentation — another rear projection deal, but this time into a dome-shaped screen that rises from the floor and might be said to resemble the end quarter of a water melon enlarged a great many times. Two synchronized projectors inside the dome project on its surface a graphic explanation of oil-bearing geological formations and new drilling methods.

It is interesting to note that these shows or exhibits were produced jointly by Walt Disney and the interested business organizations — American Motors, TWA, and Richfield Oil. The companies are reported greatly pleased by the advertising and publicity they receive. It may be that presentations of this kind will become widespread before long. If so, they will provide added employment opportunities for trained projectionists. Despite the striving for automation in setting up the shows, trick projection effects cannot be properly handled by amateurs.

TRENDS IN SHUTTER DESIGN

(Continued from page 8)

loss of light occasioned by the shutter is sometimes greater than 50%. The edge of a shutter blade must cut through the light beam with great rapidity to permit maximum transmission values to be attained. Single-rotor fan-type rear shutters cut the light rather slowly, and hence require blades so wide that from 53%, or even more, of the light can be wasted. The cylindrical type of shutter is preferred by some because it is double-acting, the edge of one opening cutting down into the light beam while the corresponding edge of the opposite opening cuts up into the beam.

The claw intermittent movements used in many 16-mm. projectors provide more rapid film-pulldowns than the 3:1 geneva movements of 35-mm. theatre machines. These more rapid movements permit narrower shutter blades to be used for less light loss. The pin-cross movement of the Powers 35-mm. projector was a satisfactory sprocket intermittent having a 5:1 pulldown ratio. Any intermittent movement as quick-acting as 5:1 permits the alternative use of two distinctly different shutters: a 2-blade shutter for increased light transmission and a 3-blade shutter for increased freedom from flicker at extremely high levels of screen illumination.

5 to 1 Intermittent

The 2-blade shutter for 5:1 intermittents has the usual cutoff frequency of 48 cps., but blocks only 33 17/20% of the light, passing fully 66 3/20%. The 3-blade shutter, on the other hand, has the same transmission as the ordinary 2-blade shutter for 3:1 intermittents, but because there are two equally spaced balancing cutoffs instead of one, the cutoff frequency is 3×24, or 72 cps. See Fig. 1.

Highlight brightness may be increased to several hundred footlamberts without perceptible flicker when cutoff frequency is 72 cps.

Three-blade shutters can be used successfully only with 5:1 or faster intermittents, never with ordinary 3:1 geneva movements. Special accelerated geneva movements have been constructed to furnish 5:1 and 7:1 pulldown ratios. One of the best arrangements is the oscillating-cam movement designed by J. G. Jackson of Vancouver, B.C. (IP for February 1955, p. 7).

Shutterless Projectors

Because the standard occulting shutter wastes so much light, several shutterless experimental projectors have been constructed, a few of which have enjoyed limited commercial use. Shutterless projectors are also without intermittent movements, the combined function of intermittent-and-shutter system being performed optically by means of moving mirrors,

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lenses, or optical prisms. One such machine is the Mechau projector developed in Germany before the war.

The chief disadvantage of a "continuous" projector such as the Mechau is the complicated system of rotating and oscillating mirrors, the maintenance and repair of which is difficult. A simpler kind of continuous projector utilizing only a multifaced revolving prism directly in front of the aperture is now coming into use for commercial TV film pickup.

Until a really simple and trouble-free continuous projector is manufactured for the theatre, the conventional intermittent-and--shutter type of machine will continue to dominate this field. Improvements in the shutter may be expected from time to time, bringing the working efficiency of this component closer to the theoretical limit of 50% light transmission without travel ghost for 3:1 intermittent systems.

As stated previously, the single-rotor fan-type rear shutter is not entirely satisfactory. The rear-and-front combination represents a moderately successful attempt to increase the efficiency of this shutter, but is physically unwieldy. The old-style front shutter was fairly good because it could be positioned in the plane of the "aerial image" of the arc mirror or condenser, the narrowest, or most constricted, part of the light beam. The aerial image is always formed in front of the projection lens, and its diameter is independent of the diameter of the lens.

Reducing Heat on Film

Modern projection requires the shutter to be placed between the lamphouse and the mechanism to reduce heating of the gate and film. The double-rotor fan-type rear shutter, although mechanically complex, is an improvement over earlier fan-type rear shuttters, inasmuch as the two rotors or "fans" revolve in opposite directions and cut through the light beam twice as fast.

The cylindrical, or barrel-type, shutter used in the Motiograph is regarded as highly efficient. This is invariably placed behind the aperture, and hence possesses the cooling advantages of other rear shutters. It is double-acting, and accordingly cuts the beam very rapidly. Most cylindrical shutters of European manufacture contain automatic fire fins which operate by centrifugal force, thus eliminating the need for a fire-shutter arrangement geared to the mechanism.

The 2-blade "dished," or conical, shutter as used in the Simplex XL has a transmission efficiency as high as that of the double-acting cylindrical shutter. The conical shutter is placed close to the aperture where it effects very rapid cutoffs. Better still, in the writer's opinion, is the 1-blade conical shutter which revolves twice as fast as a 2-blade conical shutter of similar size.

The "Silent" Days

It is of interest to note that the normal rate of film travel for silent pictures was 16 frames per second. The shutter cutoff frequency was then 32 cps., tolerating a highlight brightness of only about 2 footlamberts, equal to a screen brightness level of about 4 footlamberts. At higher brightness levels pronounced flicker was visible.

The high brightness levels of Tv picture tubes require a much more rapid "field rate" than the shutter cutoff frequency employed in sound motion pictures (48 cps.). Indeed, the highlight brightnesses encountered in home Tv sets range from 15 to 150 footlamberts, corresponding to motion-picture screen illumination levels of 30 to 300 footlamberts. Experience has shown that the field rate should be at least 40 cps. for the 15-footlambert highlight level, and at least 60 cps. for the 150-footlambert highlight level.

Shutters for Tv

A field rate of 60 cps. was selected for Tv transmission in American practice, not only because it is rapid enough to make flicker imperceptible at the higher brightness levels, but also because it corresponds with the alternating-current frequency of commercial power in the United States.

Adoption of a 60-cycle field rate ("frame rate" of 30 per second for interlaced scanning) introduced difficulties in the transmission of motion-picture films which, of course, are photographed at 24 frames per second. To have increased the projection speed to 30 frames per second would have had adverse effects upon sound reproduction.

These difficulties were obviated by film-reproducing systems which functioned in an unusual manner. To resolve the difference between the motion-picture film rate of 24 frames per second and the Tv field rate of 60 scannings per second, a special timing was introduced to provide an average of 2½ scannings per frame of film: 24 frames × 2½ = 60 fields.

[TO BE CONCLUDED]

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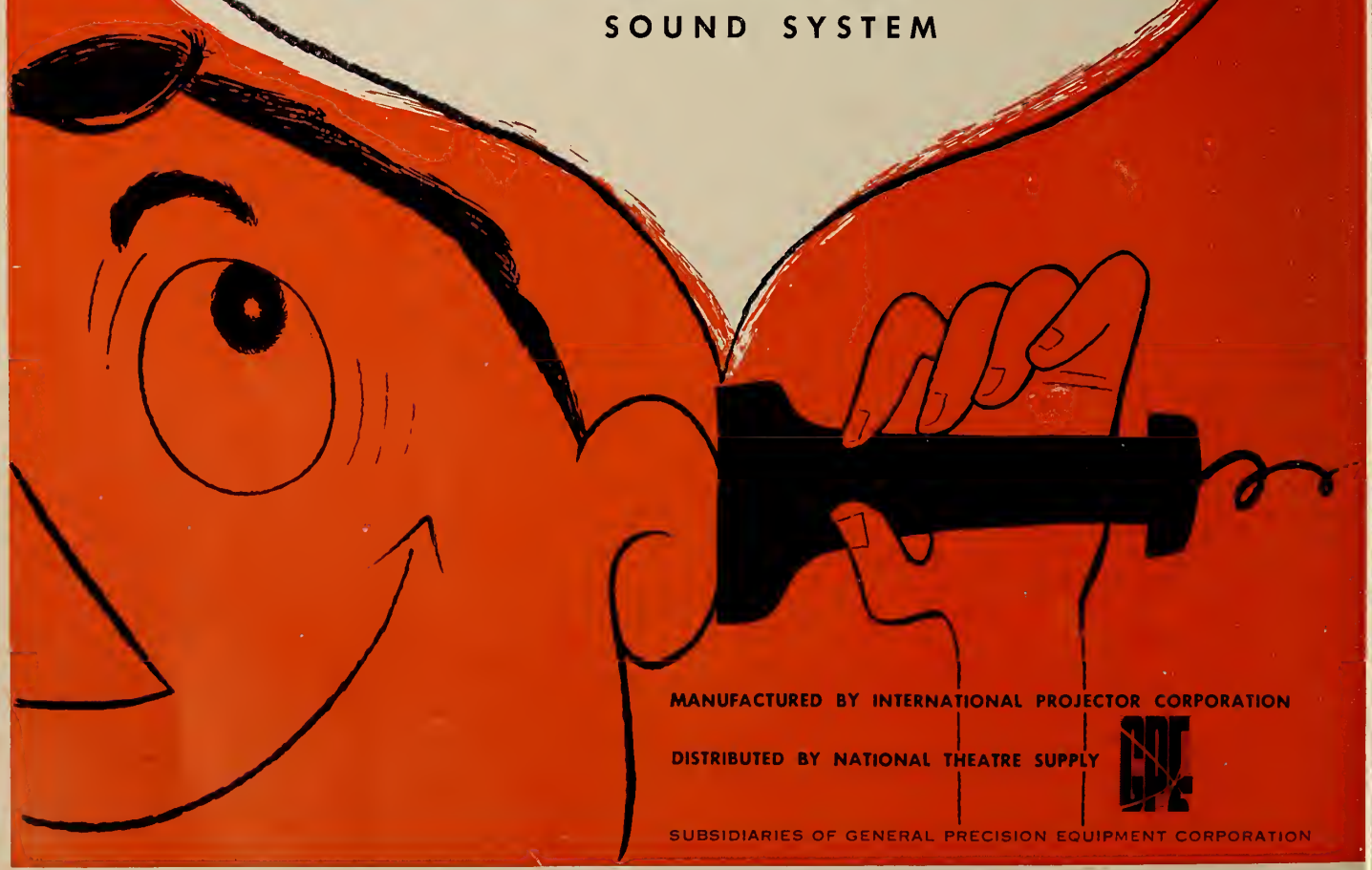
"Up here in the booth, for instance, we want a system that's solid. A system that doesn't have to be babied or coddled all the time . . . one that has plenty of stamina and runs smooth and easy.

"Maintenance means a lot, too, I told him. Projection and sound systems have to stand up under lots of wear — you don't want one that flies out of kilter every time you turn your back.

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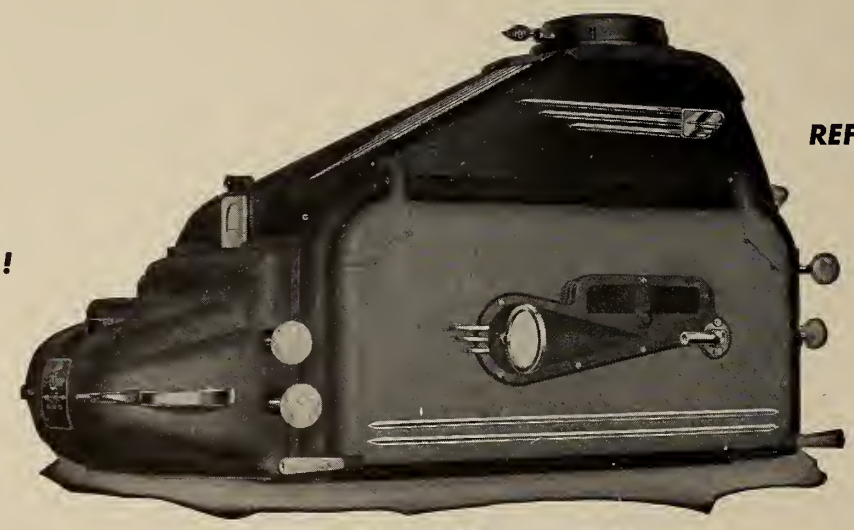
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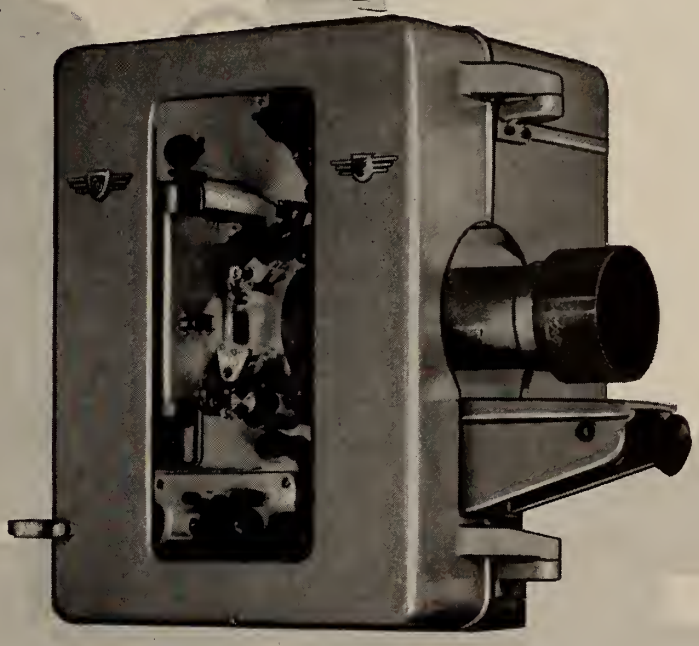
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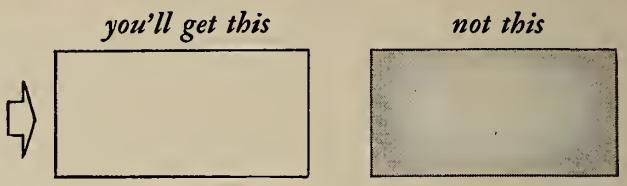
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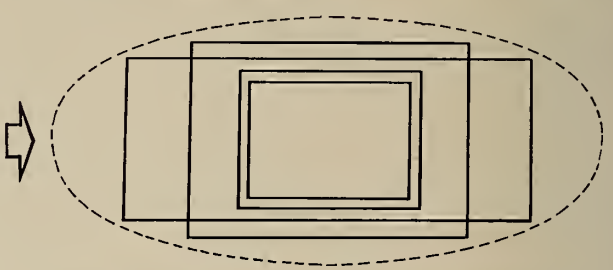


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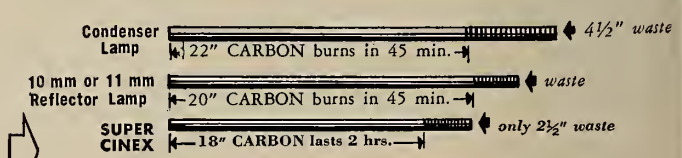
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3—Diagram at right indicates the enormous encompassing power of the SUPER CINEX light beam.

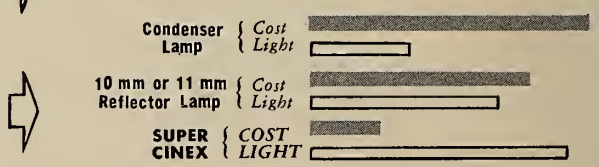


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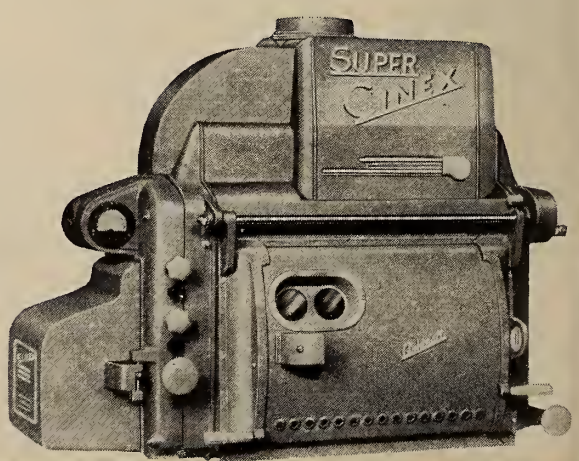


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9E

Monthly Chat

Release Print Confusion Must End

THIS MONTH IP carries a chart prepared by the Motion Picture Research Council which describes the characteristics of *fifteen* different types of 35-mm release prints now available or shortly scheduled for distribution. This chart is a most extraordinary sight indeed. Two thoughts will probably occur to a projectionist when he examines it. First, he will wonder if this imposing variety of prints is necessary. Wouldn't two or three, or maybe four, be enough to take care of anamorphic projection, non-squeezed widescreen pictures, and magnetic and optical sound reproduction? Second, he will be puzzled by the tricky trademarks, supposedly of "new processes."

The conclusion we at IP draw from all this is the obvious one that many of these prints are unnecessary. One gets the impression after examining the chart that some of the studios are jockeying for position and are bent on confusing both the exhibitor and the projectionist.

For example: Although IP often takes issue with 20th Century-Fox over features of their magnetic sound reproduction methods, we think the CinemaScope anamorphic system is a good idea and that it serves a real purpose in providing moviegoers with a visual experience that they can't possibly get on their home Tv sets. We feel at the same time, however, that it is both confusing and downright nonsense for another studio to change this system slightly and call the result a "new process."

Who Steered Us Wrong?

IN A TALK before the recent convention of the SMPTE at Lake Placid, Loren Ryder, the technical chief at Paramount Pictures, who has often contributed interesting articles to IP, declared that "equipment manufacturers who are complaining that sales are off as compared with last year are trying to find ways of getting all of our profit all the time."

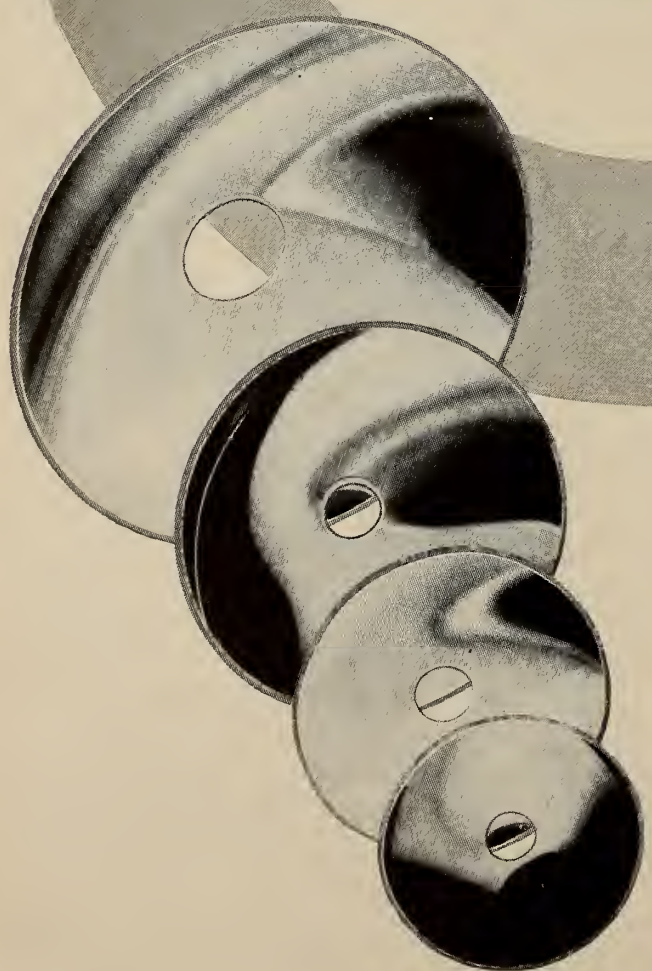
Now it is quite true that exhibitors have purchased equipment during the past few years that couldn't pay its way. 3-D equipment is a case in point. There is little or no use now for giant magazines, or selsyn interlocks, or the separate sound reproducers that some theatres installed for the early stereosound.

The question remains, however, of just who are responsible for theatres purchasing this equipment. Was it the equipment salesmen, or was it the Hollywood producers, including those at Paramount, who pushed the 3-D idea hell-for-leather when nobody was sure whether it would really work, or audiences take to it?

We think the studios should accept responsibility for this waste, and we also feel that they are *still* creating confusion and trouble. The Motion Picture Research Council chart, mentioned at the beginning of this column, is proof of that. The old standard of a single type of 35-mm release print is probably gone forever—and good riddance. The old standard was a penny-wise cost-saving device that came close to destroying the industry. On the other hand, if progress is to be made with any degree of smoothness, it is necessary for the studios to restrict themselves at least to those new processes that have something to offer.

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The Todd-AO System: A Projector For Both 70- and 35-mm Film

By JAMES MORRIS

The American Optical Co. and Philips of Eindhoven cooperated to design this versatile projector. The system is an example of the new trend toward "roadshow" motion picture exhibition.

TODD-AO, which is probably the most ambitious single-projector motion picture system ever devised, was unveiled to the industry on the 12th of this month when the new film, "Oklahoma," opened at the Rivoli Theatre in New York City. Since IP went to press before this premiere, it is impossible to give any evaluation of the screen image obtained with the 70-mm Todd-AO equipment, or the audience reaction to its giant-sized, deeply-curved picture. That will have to wait for next month.

However, fairly detailed information is now available on the equipment used in the Todd-AO setup, and projectionists will want to know about this equipment as soon as possible. The Todd-AO system is a prime example of the new "roadshow" trend in the American motion picture business.

As of now, it seems likely that within a few years American indoor theatres will be divided into two categories. One group will include a number of de luxe houses equipped with projection machinery of the Todd-AO variety for roadshow (two-a-day) presentation of special and elaborate films. The other group, which will remain the vast majority, will continue to use 35-mm projection equipment of substantially the same character as that now available.

For 70- and 35-mm film

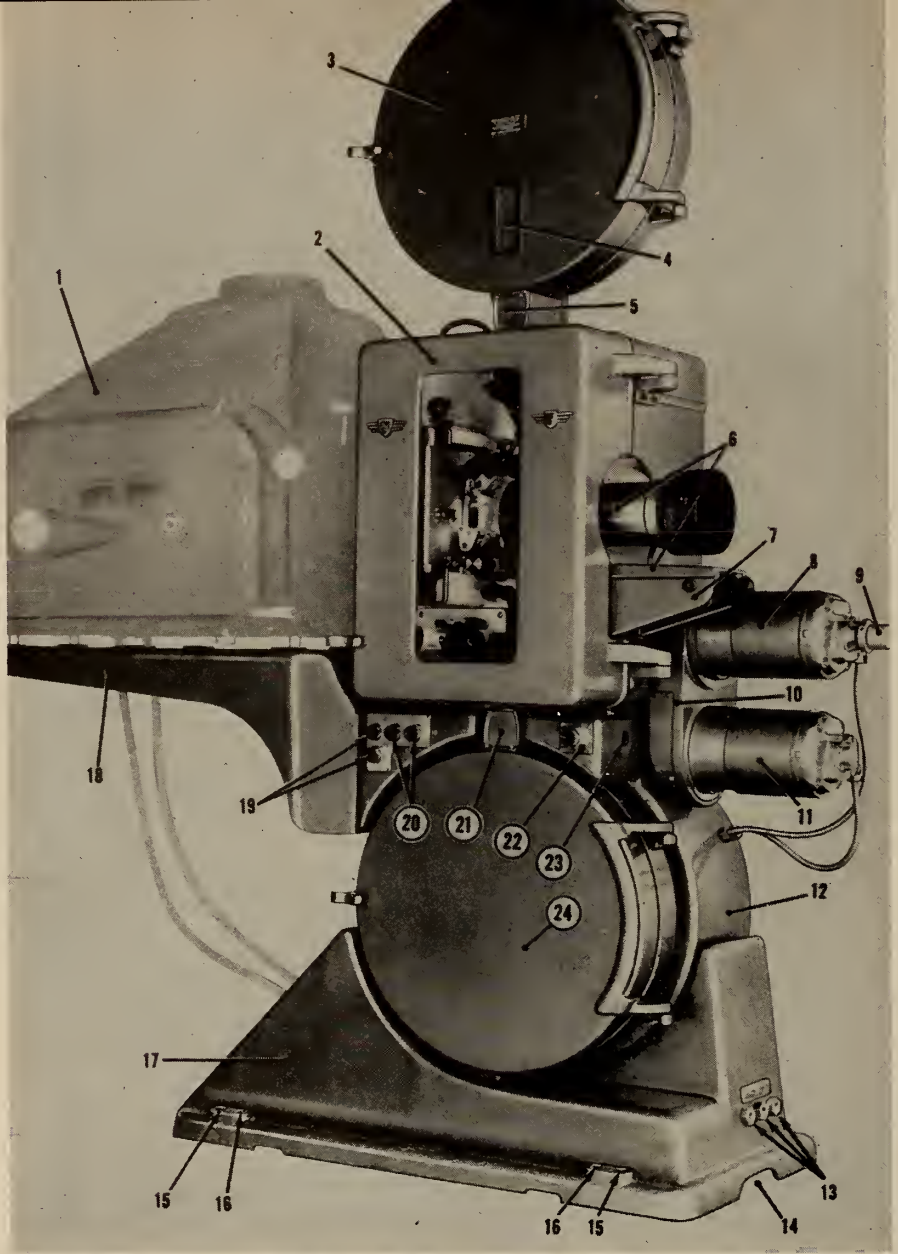
The Todd-AO projector is designed for 35- as well as 70-mm film. By switching a few parts in the projector head, it can be made to accept 35-mm prints and pick up either standard optical sound or CinemaScope magnetic sound. It will not only equip de luxe theatres to show films in a spectacular way, but also in just about any way that a desirable picture happens to be printed.

Although it has many new optical, mechanical and electronic features, the Todd-AO system used for "Oklahoma" relies basically on the big film image for its effectiveness. There is nothing new about this idea. It was used back in the Twenties for the Grandeur process. The VistaVision horizontal projector, introduced last year by Paramount Pictures and the Century Projector Corp., obtains a greatly-enlarged film image by turning a 35-mm film strip on its side and pulling it sidewise through the special projector.

It has been clear for the last two years that a screen image of the highest quality is difficult to obtain on very large indoor screens because of the tremendous magnification required of the 35-mm film frame. This is true not only with the cropped widescreen aperture for non-anamorphic pictures, but also of the larger CinemaScope aperture. Consequently, 20th Century-Fox is now making 55-mm prints of some CinemaScope features scheduled for roadshow presentation.

High-quality 35-mm projection equipment can give good results on screens up to as much as 50 feet in width, but this equipment is just not up to the job of providing quality performance on screens of this size or larger in indoor theatres.

One of the most interesting refinements of the Todd-AO system is a distortion-correcting printing process developed by Dr. Brian O'Brien, of the American Optical Co. (This is where the AO in Todd-AO comes from.) The corrective-printing proc-



This is the new Todd-AO projector for both 70-and 35-mm film. The projector head is manufactured by Philips of Eindhoven, in Holland, and the rest of the machine and the special lenses required for the Todd-AO system are produced in the United States by the American Optical Co. Features of the new projector, indicated by number, are as follows: (1) arclamp; (2) projector head; (3) upper magazine; (4) window; (5) upper fire trap; (6) CineApergon objective lens and mount; (7) lens mount bracket; (8) upper motor; (9) inching knob; (10) belt housing; (11) lower motor; (12) upper base; (13) water line connections; (14) cutout for electrical leads; (15) hold-down screws; (16) leveling screws; (17) lower base; (18) arclamp bracket; (19) arclamp push button switches; (20) motor push botton switches; (21) lower fire trap; (22) motor selector switch; (23) connector hole, optical sound cable, and (24) lower magazine.

ess, which is roughly described in an accompanying illustration, is asserted to eliminate image distortion that would otherwise be present on a giant, deeply curved screen when projection is from a steep angle. According to a recent American Optical Co. announcement, it basically employs an optical method of distorting the print in processing so that the optical distortion inherent in the type of projection mentioned above is counterbalanced.

Three types of distortion will be corrected, it was stated — keystone distortion, distortion resulting from a deeply-curved screen, and distortion resulting from the use of extreme wide-angle lenses in both photography and projection. Two classes of prints will be processed. One class will be corrected for projection angles of from 10 to 15 degrees, and the second for still higher projection angles.

The Todd-AO projector is an unusual machine designed to handle multi-channel sound for Todd-AO, 35-mm magnetic sound for CinemaScope, or conventional optical sound. All three types of sound pickup are provided for inside the projector head. The only action that need be taken when changing from one type of sound to another is to thread the film through the desired soundhead. Even sound on separate film can be used by means of a selsyn synchronizer which is available on an optional basis.

The Peerless Hy-Candescent condenser arclamp, manufactured by the J. E. McAuley Co., of Chicago, is used with the Todd-AO projectors at the Rivoli Theatre in New York. These lamps are equipped with a new type of water-cooled jacket for the positive carbons. These jackets are made by the Hal I. Huff Co., of Los Angeles.

The projector is said to be adaptable to a wide variety of arclamps, but only certain high-powered lamps are recommended at present. The tilting mechanism of the projector rotates at a high point so that there is only a slight change in the center of gravity when it is tilted up or down. Projection angles as far down as 28 degrees and, for drive-ins, as far up as 20 degrees can be reached.

Other features include a centrifical switch to drop the dowser if the film speed is too low, a water flow switch to cut off the arc if the water-cooling equipment fails, and stop switches on both sides of the chassis. The optical preamplifier is of a special plug-in design so that a new unit can be substituted quickly in case of breakdown.

Mechanism Water Cooled

The projector is water-cooled, but it contains no air cooling other than the fanning action generated by the shutter. The film gate is slightly curved above and below the aperture for the purpose of counteracting the tendency of film to buckle under heat.

A single-bladed shutter revolves twice through the film path for every frame of film. Todd-AO engineers claim for it a light-transmission efficiency of over 50%. Two separate motors are provided to drive the mechanism at 30 and 24 frames per second, depending on whether 70-mm or 35-mm film is being projected. For reasons to be given later in this article, a speed of 30 frames per second is used for 70-mm film. Two motors are employed, rather than one plus gears, because this arrangement is said to provide quieter operation with a minimum of gear complexity.

The projector mechanism is manu-

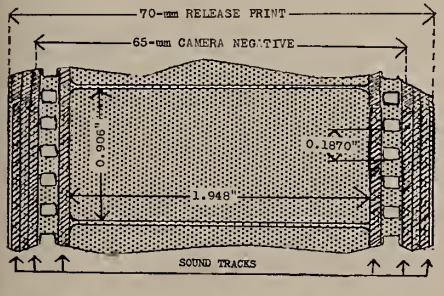
factured by Philips of Eindhoven, in Holland, but the rest of the unit, including lenses, base, magazines and other parts, are produced in the United States by the American Optical Co. Both companies cooperated in the design of the projector.

Screen Design Problems

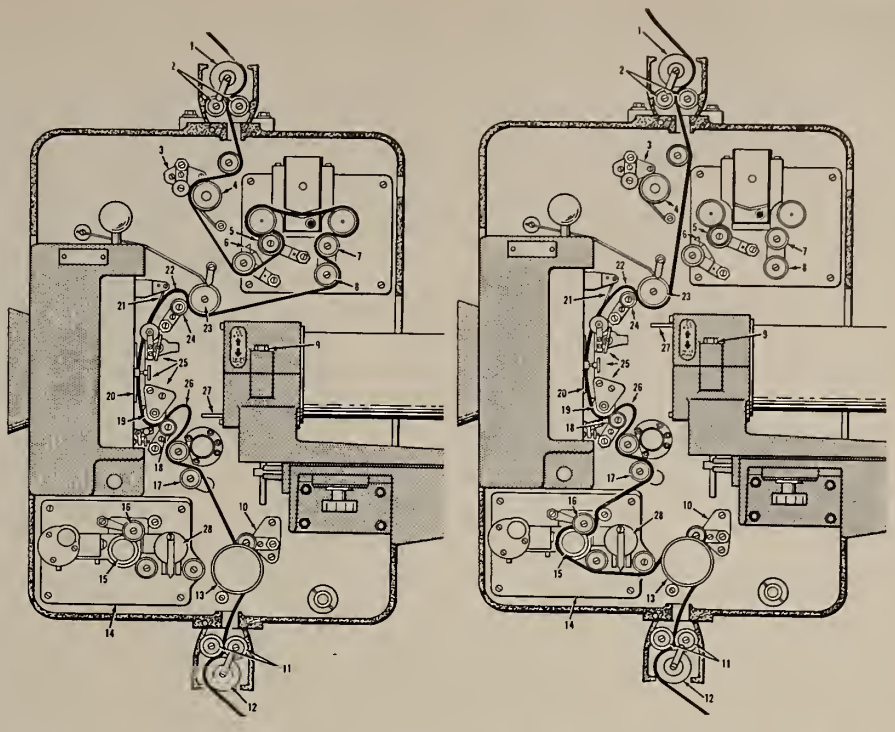
The screen specified for the system is deeply curved and large. According to Todd-AO engineers, use of such a screen posed two problems — re-illumination, and maintaining an adequate level of screen brightness. They use the word re-illumination to describe what happens when light shining on one section of a deeply-curved screen scatters to another part, merging colors and reducing contrast. The brightness problem was felt to be partly solved by the large Todd-AO aperture.

The screen selected has a moulded plastic surface with differently angled lenticulations along its width. The screen is coated overall with aluminum. The lenticulations, or concave reflecting surfaces, are so designed as to reflect light striking any portion of the screen's curvature so that it is reflected only to the auditorium and not to the other side of the screen, it is reported. To accomplish this, the lenticulations must have a different reflective angle at the sides of the screen compared with those near the center.

As a result, the screen must be constructed of a varying number of vertical sections, the number varying with a particular installation. About 12 are used in New York. Seams of the screen are joined in the rear by Fibreglas tape, and are said to be nearly invisible to the audience and a distinct improvement over those in the vertically-sectioned and lenticulated Miracle Mirror screen manufactured by 20th Century-Fox during the early days of CinemaScope.



Seen here is a drawing of the 70-mm Todd-AO print film. The wider areas of sound striping outside the standard-size sprocket perforations each carry two magnetic sound tracks. The more narrow stripings inside the sprocket holes each carry one track. The total is six sound tracks.



Shown above is the interior of the Todd-AO projector head. At left is shown the film path when 70-mm film is used with Todd-AO magnetic sound. At right the projector is threaded for 35-mm film and optical sound. Components of the machine are identified by number as follows: (1) and (2) upper fire trap guiderollers, (3) upper pad roller, (4) upper feed sprocket, (5) nylon pressure roller, (6) tension indicator, (7) pilating guide roller, (8) adjustable guide roller, (9) lens mount clamping bolt, (10) lower pad roller, (11) and (12) lower fire trap rollers, (13) hold back sprocket, (14) optical sound unit, (15) sound drum, (16) pressure roller, (17) guide roller, (18) lower film gate pad roller, (19) intermittent sprocket, (20) aperture plate, (21) pressure bands, (22) upper loop, (23) intermediate sprocket, (24) upper film gate pad roller, (25) film gate, (26) lower loop, (27) lens mount lever, (28) exciter lamp housing.

Although screen manufacturers regard the lenticulated screen as a very good idea, it has been little used since the Miracle Mirror days. The embossing process was found difficult on a mass production basis, according to one screen manufacturer, and the exact directional reflective quality difficult to guarantee.

The Todd-AO lenticulated screen, which overcomes previous difficulties with this type of screen, is manufactured by the Textileather Division of the General Tire & Rubber Co., Toledo, Ohio. The lenticles of the screen are embossed by means of machinery developed by the American Optical Co. Each lenticle is about 0.50" high and 0.33" wide, and they vary in spacing and in angle across the screen.

Special wide-angle projection lenses are required for the Todd-AO process. Manufactured by the American Optical Co. and known as Cine-Apergons, these lenses have specially-designed aspherical surfaces on some of their elements. Without these lenses, it is reported, the optics would have been the weak point in the system.

Ordinarily, a lens is made up of a number of concave or convex elements whose surfaces follow a spherical or truly circular arc. In an aspherical design, a lens may contain elements with surfaces that follow, for instance, an ellipsoid pattern. The purpose of this departure from the usual design is to solve an unusual or difficult optical problem.

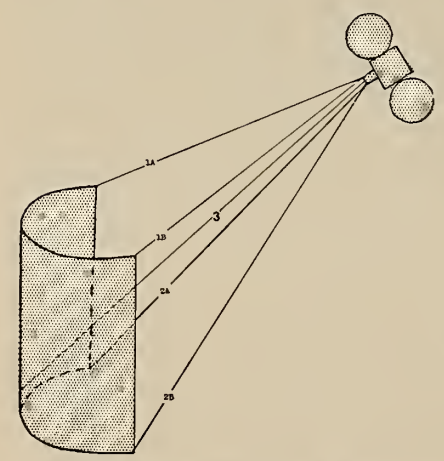
"Oklahoma," the first Todd-AO feature, was photographed on 65-mm Eastman Color negative, and is being shown on 70-mm Eastman Color prints, the extra 5-mm of space on the print is required to make room for the magnetic striping of the 6-channel magnetic sound that is being used.

Film frames are not only larger in the Todd-AO system, but they move faster — at a rate of 30 frames per second. This change was considered

necessary because the human eye is very sensitive to movement and flicker that occur at the edges of a wide field of view. The eye, therefore, is more conscious of flicker that occurs on the edges of a wide screen than it is of flicker at the center of the screen. Flicker also becomes more perceptible as the light level on the screen increases.

The designers of the system say that they were presented with a choice between a dim picture without apparent flicker, a bright one with flicker — or a greater frame frequency, which would permit a bright picture without flicker. The last was chosen even though it meant a considerable departure from conventional design for a theatre projector. The 30-frame-per-second speed also has the advantage of making action on the screen smoother during fast movement.

A sound reproduction system which is both complicated and versatile has been designed to reproduce the six magnetic tracks used in the Todd-AO system. This equipment will also accept any type of 35-mm sound system now in use.



The above diagram shows why a distortion-correcting printing process, one of the features of the Todd-AO System, was felt to be required. This printing method will counterbalance the distortions inherent in projection on a deeply-curved screen from steep projection angles. 1A, 1B, 2A and 2B indicate portions of the image striking the four corners of the screen. The lines at bottom must travel further and will therefore spread more than the lines at the top, causing the familiar keystone distortion. Observing line 3 will show that this distortion is even further compounded by the fact that portions of the image striking the center of the screen will always hit lower than portions striking the edge. By means of simple test patterns, an accompanying diagram shows how this distortion looks on the screen and how the Todd-AO people plan to correct it.

Sound for the performances at the Rivoli Theatre in New York City is obtained from a separate sound film which contains six tracks and is synchronized to the projector by means of a selsyn interlock. However, the Altec Service Co. is now beginning delivery of a switching-relay-equalizer rack designed for the Todd-AO system which will enable the projector to handle sound-on-film reproduction of the 6-track Todd-AO system plus the sound carried on all magnetic and optical prints. Orders for this relay rack have been received for 50 theatres throughout the country.

How Altec Panel Functions

The Altec panel provides individual equalization and level balancing controls — screw-driver operated — for 20 magnetic tracks. On a two-projector installation, the facilities allow setting the six Todd-AO channels on each projector for identical quality; likewise the four CinemaScope channels on each machine. In addition, a compact equalizer is provided for adjusting the Perspecta-optical channel response. For a third projector, a somewhat similar panel appears lower on the rack.

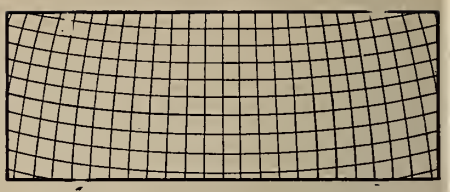
The system thus becomes fully compatible with any of the present-day regular theatre sound systems, capable of reproducing, in conjunction with the Todd-AO projector, all regular release prints.

The Altec-Todd-AO SRE rack contains seven separate panels, with the entire assembly housed in a ventilated heavy steel cabinet. Providing quick and easy access to tubes, fuses, and other components is a heavy door, with air vents top and bottom. The door protects against accident or tampering, and allows for concealed wiring and cabling.

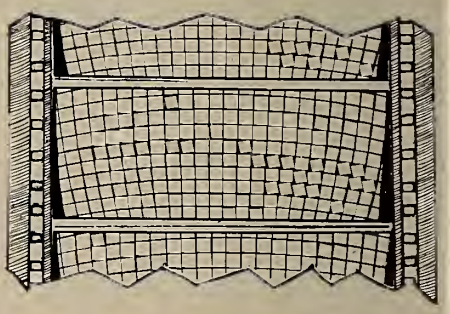
The foregoing was a summary of the information available at press time on the equipment used in the Todd-AO system. As was said at the beginning of this article, no critical evaluation of the process can be given until it is possible to view "Oklahoma" on the screen and judge the performance of the equipment under regular operating conditions.

There is, however, one question about the Todd-AO system that can be raised now because it relates to a doubt voiced by IP over the last two years — this question is on the value

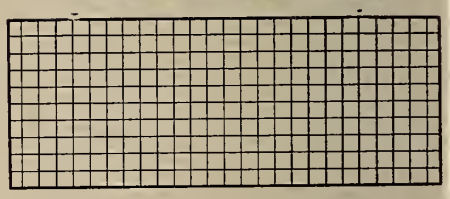
Distorted Screen Image



Distortion-Correcting Print



Corrected Screen Image



The top section of this drawing shows how straight horizontal and vertical lines are distorted by keystone and screen curvature. Distorting a print in processing so that vertical and horizontal lines would take the shape shown in the film strip at center could counterbalance this distortion and provide straight lines on the screen shown at bottom even though that screen be curved. These diagrams are not meant to be an exact description of the Todd-AO corrective printing process. Their purpose is to explain in simple language how it works. In addition to the two types of distortion mentioned above, the Todd-AO method also corrects a print for distortion caused by the use of extreme wide-angle lenses in photography.

of a deeply curved screen. The screen used at the Rivoli Theatre in New York is 63 feet wide, 27 feet high, and curves to a depth of 13.3 feet. The chord of the screen (the distance from one edge to the other) is just over 50 feet, presenting viewers with an effective aspect ratio of approximately 2/1.

In a recent announcement, the Todd-AO Corp. stated as follows:

"Another aspect of the deeply curved screen is its freedom from squeezed images. Most theatre-goers are familiar with the strange elongated narrow figures that are seen from the side seats in the front row. This effect,

(Continued on page 34)

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- Automatic Crater Positioning Control System insures that both carbons are so fed as to maintain a correct arc gap length and to keep the position of the positive crater at the exact focal point of the reflector. Screen light is always the same color, without variations from white to blue or brown.
- The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.
- Water-cooled carbon contacts (optional.)

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SMPTE Survey of Drive-In Theatres

By FREDERICK J. KOLB, JR.
Chairman, SMPTE Screen Brightness Committee

Twenty-six outdoor theatres surveyed to assemble data on the effectiveness of projection equipment. Following are abstracts from the committee report.

PREVIOUS STUDIES of screen brightness in indoor theaters extending over a period of 15 years have been instrumental in setting screen-brightness standards, the latest of which was published in 1953.

But during the last 10 years the drive-in theatre was developed and has grown so that this type of exhibition now accounts for about 23% of all the theatres in the U.S. and at least 20% of the boxoffice gross.

From the very first, however, the drive-in theatres have been different in many important ways from the indoor theatres. They have operated consistently with lower screen brightnesses—partly for lack of practical means for putting enough light on the screen.

Inasmuch as there has been very little data on either trade practice or the requirements for good viewing in drive-in theatres, these theatres have been, until now, excluded from consideration when screen-brightness standards were drawn up.

During the past year and a half the Screen Brightness Committee has been making measurements in a small group of drive-in theatres, in order to begin the accumulation of quantitative information.

Considerable data about each of 26 theatres were noted in order to have sufficient information to plan a more extensive survey if that should be desirable, to list the practical operating problems of drive-in theatres and to assess the possibilities for changes in existing theatres. These observations may be grouped under the following general headings:

(1) Screen brightness including light distribution on the screen, variations between projectors, screen reflectivity, and directional performance.

(2) Geometric characteristics including theater size, screen size, aspect ratio and viewing angle.

(3) Equipment characteristics including light source and power supply, picture mechanisms and projection methods.

Some of the factors which now seem most significant are summarized in this report.

Figure 1 summarizes industry information on the distribution of all U.S. drive-in theatres according to capacity. Figure 2 gives this same information for the theatres covered in our preliminary survey.

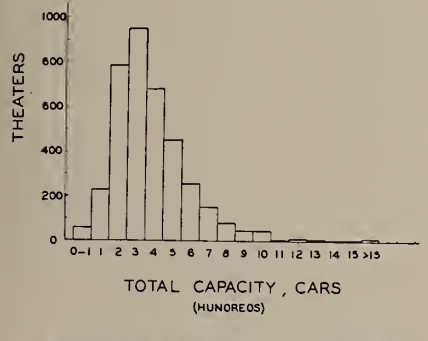


FIG. 1. This is a breakdown of drive-in theatres according to size. The numerals on the left represent theatres. The figures underneath each bar indicate the capacity of a theatre when multiplied by 100. For example: The third bar from the left represents the number of drive-ins of 200-car capacity. Checking the numeral on the left of the top of this bar shows that there are slightly less than 800 of these. This graph was prepared from a nationwide breakdown, including all drive-ins. The succeeding graphs were prepared from the SMPTE sampling of 26 theatres.

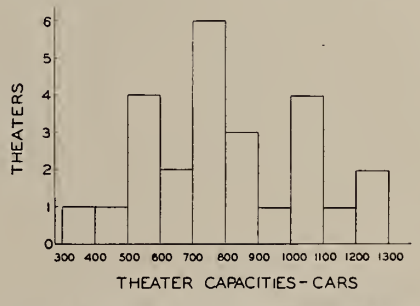


FIG. 2. This graph shows how the 26 theatres included in the preliminary survey vary according to size. Here the figures at left indicate the number of drive-ins as above, but the figures at bottom need not be multiplied.

Figure 3 tabulates screen width in theatres measured while Fig 4 presents the aspect ratios of these screens. It will be seen that some very large screens were measured but that for the most part there were relatively few theatres, at the time of these measurements, converted to the high aspect ratio.

The Committee believes the specifications for these 26 theatres show them sufficiently representative to define the general features of drive-in picture presentation.

Brightnesses measured at the centers of the screens in these drive-in theatres are summarized in Fig. 5. This curve will be found to have no similarity at all to the brightness distribution in indoor theatres. American Standard Ph22.39-1953 specifies a brightness between 9 and 14 foot-lamberts *for indoor theatres;* actually 50% of the indoor theaters measured in 1950-51 fell within this standard, 26% were below the standard, and only one out of 125 indoor theatres was below 4 foot-lamberts. In the drive-in group on the other hand the brightness is 3.0 foot-lamberts and 82% are below 4 foot-lamberts. There was no drive-in theatre measured with a screen brightness in the 9-14 foot-lambert range.

Figure 6 presents the screen reflectivity in the various theatres, indicating a wide range of screen sur-

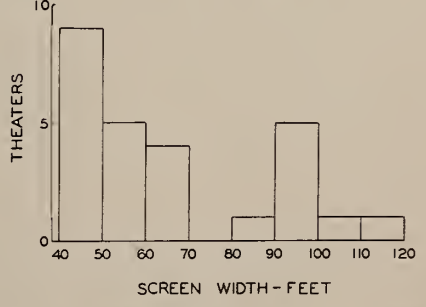


FIG. 3. Screen widths of the 26 drive-in theatres measured are represented here. The figures at left indicate the number of theatres, and the figures at bottom show the width of the screen.

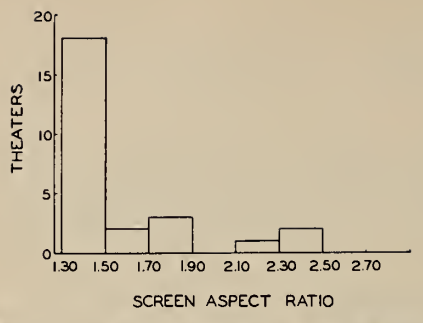


FIG. 4. Screen ospect rotios of the theotres surveyed ore shown. For exomple: The first bor represents the rotio 1.30/1 to 1.50/1.

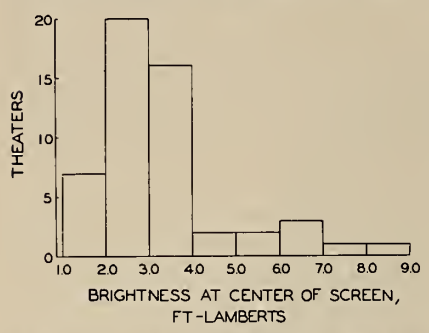


FIG. 5. Screen brightness dato from 26 drive-in theatres meosured during 1953 and 1954. Numerols ot left indicote number of theotres. Numerols ot bottom represent brightness at center of the screen in foot-lomberts. For exomple: First numerol is 1.0 foot-lamberts, the second 2.0, ond so on. A decimol point should be understood to exist before the zero in eoch number.

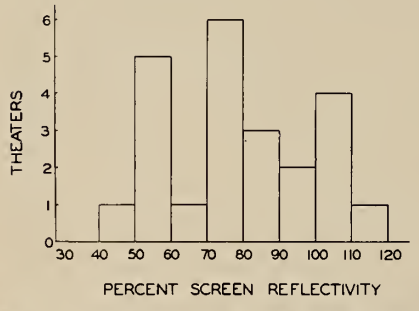


FIG. 6. Screen reflectivity in the drive-in theatres surveyed. Figures ot bottom indicote percentages. Values over 100% indicote directional screens. Volues below 60 or 70% imply deteriorated or dirty surfaces.

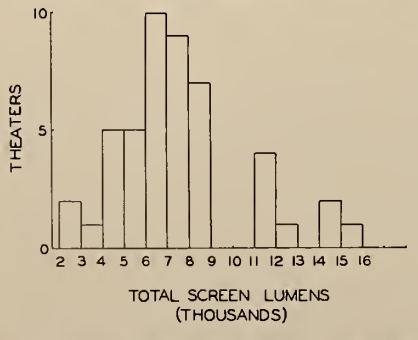


FIG. 7. Totol screen lumens output from projectors in the drive-in theotres surveyed. Figures at bottom indicote thousonds of lumens with projector ond shutter running.

faces from directional through matte and on down to inefficient surfaces that should be replaced. Figure 7 summarizes the total screen lumen output measured with the projector and its shutter running. These data indicate a range in projection equipment and in performance of this equipment all the way throughout the complete output range to be found in indoor theatres.

Much Low-grade Equipment

It is apparent therefore that the large screen size is not alone responsible for low screen brightness in drive-in theatres. There is a great deal of low-output equipment used in the smaller theatres, as if low screen brightness had been a design objective.

Specularity of the projection screen was inferred from the data of Fig. 6, where at least 20% of the theatres measured showed higher screen reflectivities than would be provided by matte screens. Further information is given in Fig. 8. where the screen brightness at approximately 18 degrees off the axis is expressed at a percentage of the brightness when viewed along the axis. Values significantly below 100% identify screens which are specular, and which at the same time tend to show a brightness fall-off within the audience viewing area. More than 20% of the theatre screens in Fig. 8 show such fall-off.

Much of the discussion of drive-in viewing centers on the apparent size of the screen from the audience position, or in other words the angle which the screen subtends at the observer's eye. Figure 9 presents an average condition—the horizontal angle subtended by the screen width when viewed from the center of the middle ramp. Approximate maximum and minimum values are shown in Fig. 10, where this subtended angle has been plotted for viewing from the center of the first and last ramps respectively. It will be noted that the actual screen widths used in drive-in theatres may carry a misleading impression, because they are viewed from such great distances as to "surround" the audience much less successfully than the smaller screens of indoor theatres.

Somewhat similar conditions enter into the selection of a screen size for a given theater. Figure 11 indicates

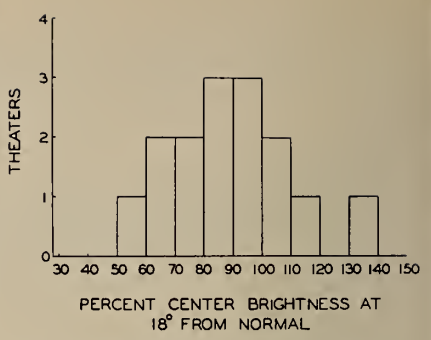


FIG. 8. This graph shows foll-off in brightness when o screen is viewed from on angle of approximotely 18 degrees from the normol. Screens showing o foll-off ot on ongle from the projection oxis ore usuolly simple directional types. This foll-off meons thot potrons toword the side of the theotre see o picture thot is less bright.

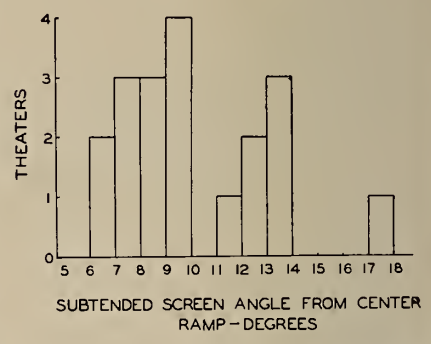


FIG. 9. This graph meosures the subtended screen ongle from the center ramp. If an observer ot the middle of thot ramp, which is halfwoy bock in the theatre, looks first ot the left ond then ot the right of the screen, his eye meosures the subtended ongle. A lorge ongle meons that the screen seems big to the observer, o smoll ongle meons thot the screen seems smoll.

the relationship between screen size and theater capacity in this survey, as feet of screen width per 100 cars capacity.

These data are presented without evaluation because there are no generally accepted standards of performance for drive-in theatres. This preliminary survey has been intended not to rate the performance of existing drive-in theaters but rather to begin the consideration of factors important in setting desirable standards.

Psychological Differences

Data so far indicate that picture viewing in drive-in theatres is in many important respects different from viewing in the indoor theaters. Not only are the physical characteristics of the theatre different but also the psychophysical audience viewing

(Continued on page 34)

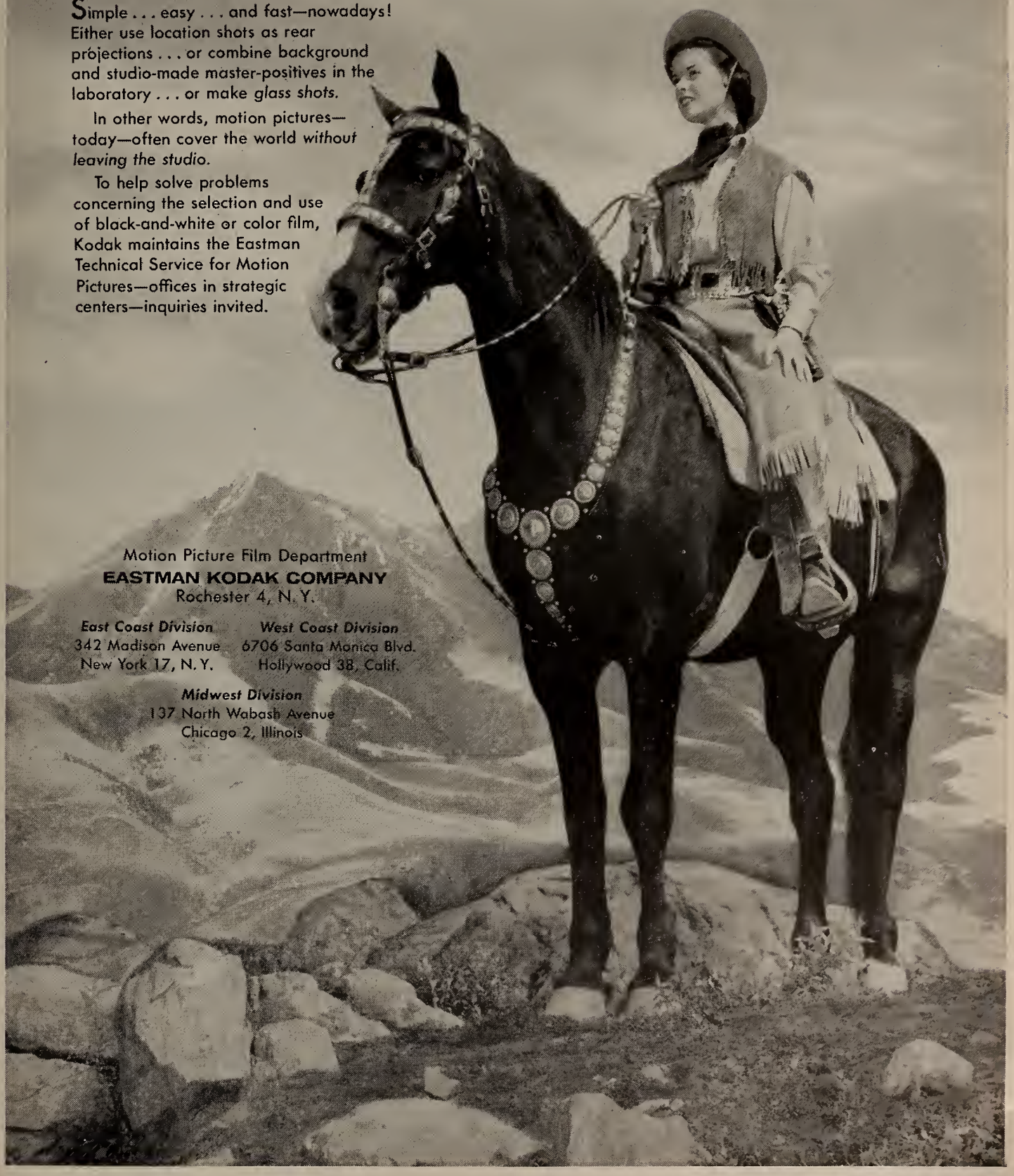
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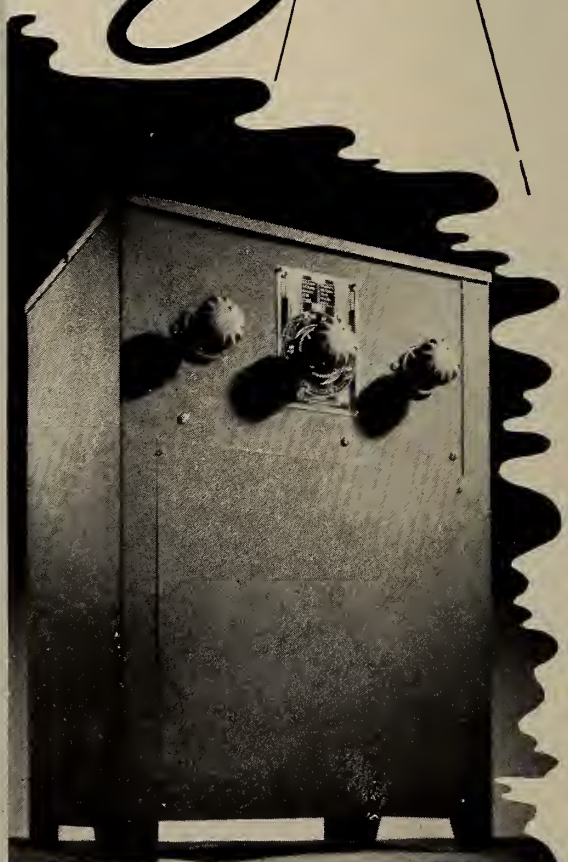
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Recent Trends in Shutter Design For Theatre and Tv Projection

By ROBERT A. MITCHELL

The special shutter problems of Tv projection are stressed in this concluding installment of a two-part series. Also provided are some suggestions for checking the condition and adjustment of theatre shutters for highest efficiency.

THE REQUIRED average of 2½ scannings per frame of motion picture film is realized in television practice by scanning one frame twice, the following frame three times, the next frame twice, and so on. This so-called 2-3-2 "frame-timing sequence" makes possible the lifelike reproduction of 24 frames-per-second films *via* 60 fields-per-second Tv transmission.

It might be thought that special projectors having a 2-3-2 intermittent pulldown are mandatory for Tv film pickup. Such is not the case, even though 2-3-2 projectors are preferred and enjoy very wide use. Ordinary projectors having regular film pulldowns may also be used, providing that the pulldown ratio is 5:1 or faster, and if a specially phased shutter is substituted for the regular projector shutter. As shown graphically in Fig. 2, standard theatre machines having 3:1 geneva movements are useless for Tv film pickup, and even 4:1 movements are not quite fast enough.

The reason for all this resides in the scanning process involved. The picture "flashed" upon the photoelectric mosaic of the camera tube (which serves as the screen) during the 1/600-second *vertical-retrace blanking periods.* These short periods are repeated at the rate of 60 per second —the Tv field rate.

The Latent Image

The light-sensitive mosaic screen of the pickup tube remains dark during the comparatively long lapse of time (3/200 second) between the blanking periods, the picture having been cut off, or "occulted,"* by the revolving shutter of the projector. These relatively long lapses are the *scanning periods* in which the *latent picture image* (consisting only of various degrees of electrical charge corresponding to areas of light and dark in the picture) is converted into a fluctuating electric current, called the "video signal," by the scanning beam in the pickup tube. The sharply focused electron beam traces out line after line until the entire surface of the mosaic has been scanned, and the latent image transmitted.

*The word "occulting" means to hide. It is used by engineers to describe the action of the shutter in concealing the film during the pulldown period.

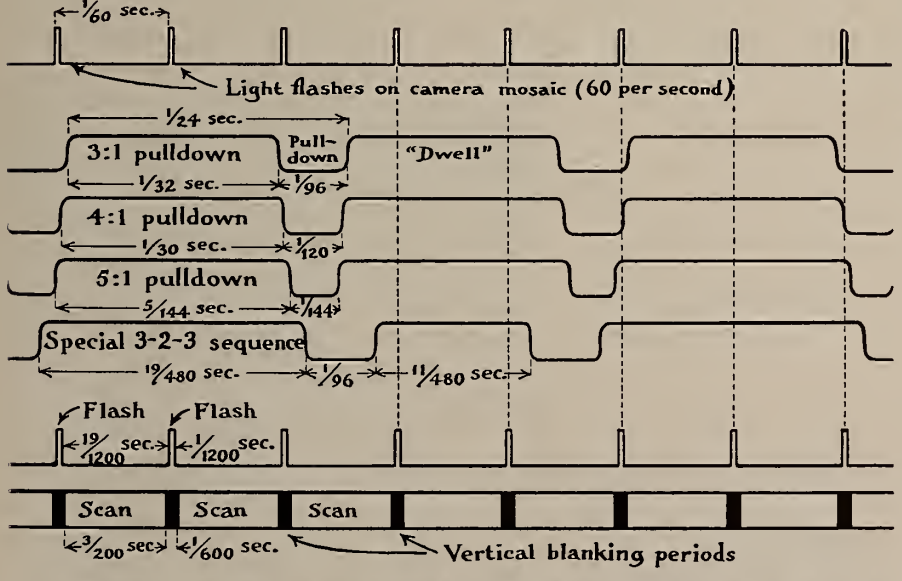


FIG. 2. Timing of film-pulldowns and exposures (1/1200-second "flashes") for Tv film pickup. Note that the picture is projected very briefly only during the vertical-retrace blanking periods, and that the latent image thereby produced is scanned in the dark. While a special intermittent having a 2-3-2 pulldown sequence is desirable, any projector having a 5:1 pulldown ratio may be used. Most 16-mm projectors have this rapid pulldown ratio. As the diagram shows, 3:1 movements cannot be used for Tv film pickup.

Now, actual projection of the film-photographs upon the mosaic of the camera tube lasts for only 1/1200 second during each 1/600-second vertical-retrace blanking period. Even though these very brief exposures may be obtained through the use of a correctly timed flashing bulb in the projector lamphouse, without any shutter, it is more common to employ constant illumination and a specially phased revolving occulting shutter.

In order to produce 60 exposures per second while the film is run at the standard rate of 24 frames per second, the shutter of the Tv projector must revolve *5 times every 2 frames,* if it have a single opening for the light to pass through, or *5 times every 4 frames,* if it be a 2-blade shutter with two openings.

To obtain exposures of the proper duration (1/1200 second), the 1-opening shutter revolving at a speed of 60 rps. must have an 18-degree opening. The 2-opening shutter, revolving half as fast, must have two 9-degree openings. Both shutters have a transmission factor of 5%, or only 0.1 of the light-passing efficiency of the usual theatre-projector shutter. (Fig. 3.)

The light-transmitting efficiency of a Tv-projector shutter is not an important factor, however, for the projected picture is very small, and the

camera pickup tube is sufficiently sensitive to give good results when a 500- or 1000-watt incandescent lamp is used as the illuminant.

Short Cut for Synchronizing

At this point it is worthwhile to consider once again the matter of intermittent film-pulldown in the Tv film-reproducing system. As we saw, the shutter is timed to produce a 1/1200-second exposure of the projected picture upon the mosaic 60 times every second. An eccentric movement which provides the 2-3-2 frame-timing sequence is desirable, but a regular movement having a pull-down ratio of 5:1 or faster gives equally good results. It is only necessary to make sure that the film is perfectly motionless during the brief periods of exposure.

The fact that ordinary 5:1-intermittent projectors can be used for Tv film pickup possesses considerable practical significance to the owners of small Tv stations unable to afford the high-priced projectors designed especially for Tv use. It happens that the claw-type intermittent movements of most 16-mm. soundfilm projectors have the 5:1 pulldown ratio. These machines may often be purchased second-hand for a hundred dollars or so and refitted with synchronous driving motors and suitably phased shutters.

Since the projector mechanism must be locked in proper time relation with the vertical synchronizing pulses fed to the camera pickup tube, a special synchronous driving motor with adjustable phasing is necessary. The regular projector shutter is removed, and the new Tv shutter, which is best made of heavy sheet metal, is attached to an extension of the motor shaft. The shutter may thus have a large diameter and be placed in front of the projection lens. Backlash must be absent from any gearing required, as timing of the Tv shutter is extremely critical.

For the very best pictorial results, an additional film aperture with a steady light-source and photoelectric cell is included within the projector to obtain a voltage control that varies with the average density of the film and, accordingly, average brightness. Without such a control, the characteristics of the camera tube may result in the blurring of dark scenes with a spurious fog.

Manual voltage control is often

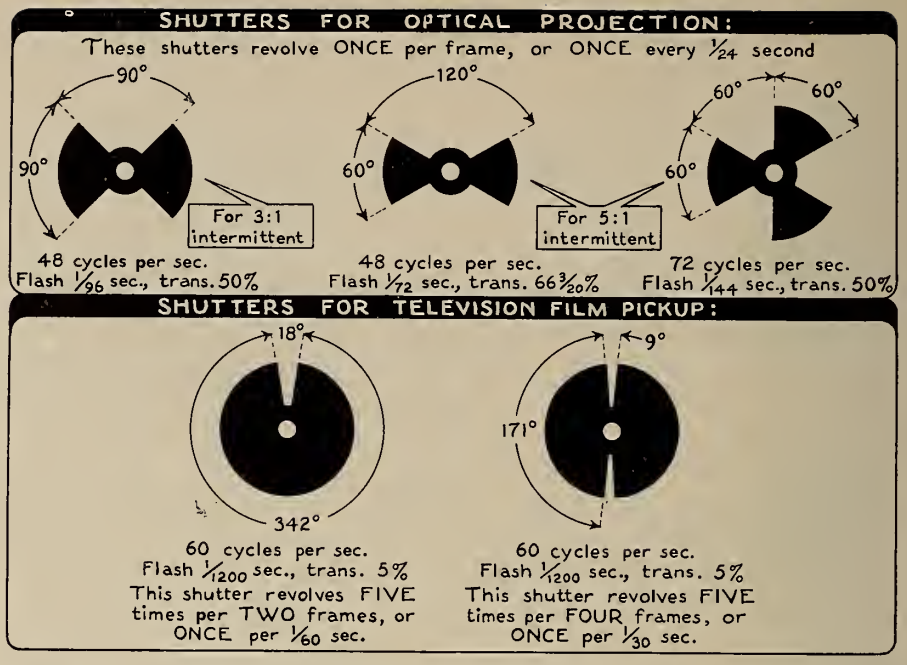


FIG. 3. A comparison of shutters for "optical" and Tv projectors. Of the two shutters having 60-degree blades, the 2-blade shutter transmits more light than the ordinary shutter for 3:1 intermittents, while the 3-blade shutter is intended for flickerless projection at the highest light levels. The two Tv-projector shutters shown function alike, the difference being their speed of rotation. Either one may be used on any Tv projector.

used, but it demands of the operator unceasing attention to picture quality and extreme promptness in applying corrections. The "engineers" of the smaller Tv studios are often untrained boys who have neither critical judgment nor the sustained interest in pictorial quality possessed by professional theatre projectionists.

The "Multiplexer" System

Usually, two projectors are set up to "shoot" into an optical "multiplexer" which directs the beams upon a single camera tube by means of diagonal mirrors. The multiplexer also provides for a slide projector, thus permitting three projectors to be focused upon the mosaic of one pick-up tube.

A very satisfactory type of Tv film-reproduction system *which is not a projector* is the "flying-spot" film scanner. Instead of light passing out through the lens of the machine, as is the case with a projector, the flying-spot scanner functions like a camera. a special external source of light being focused *upon the film* by the objective lens.

The external light-source for this device is a small cathode-ray tube similar in structure to a Tv-receiver picture tube. The main difference lies in the phosphors with which the face of the tube is coated. The phosphors used for ordinary picture tubes keep on glowing for a fraction of a second *after* the electron beam has moved on to other parts of the phosphorescent surface, reducing the effect of flicker and giving a better illusion of smooth motion in the picture.

The flying-spot cathode-ray tube, on the other hand, makes use of phosphors having an extremely rapid glow-decay. No matter how rapidly it is moved, the electron beam produces only a bright dot of light on the face of this tube. There is no "streaking effect" due to "glow persistence."

Flying Spot Scanner

The face of the flying-spot cathode-ray tube is focused upon the film by the objective lens. Now, when a uniformly bright interlaced scanning pattern is impressed upon the face of this tube, a highly luminous spot of light rapidly scans the picture on the film running through the machine. The light passing through the film is modulated by the various densities of the photographic image much in the same way as a sound-track modulates a scanning beam. The modulated light is picked up by a photocell placed behind the aperture; and the fluctuating current produced by the photocell constitutes the video signal.

Neither intermittent nor shutter is used in the flying-spot film pickup be-

cause the film-photographs are scanned directly during the actual scanning periods, not during the blanked-out vertical-retrace periods. The film accordingly moves past the lens with continuous, smooth motion; and the scanning pattern on the face of the cathode-ray tube is electrically altered to compensate for the motion of the film.

Most Favored Method

Since the response of the photocell is directly proportional to the amount of light falling upon its cathode, and because the flying spot on the face of the cathode-ray tube can be made very small, the flying-spot film scanner gives images of a quality far superior to that afforded by conventional Tv film machines which project pictures upon the mosaic screens of "storage-type" camera tubes.

So far as actual engineering experience is concerned, some difficulty has been encountered in providing an absolutely smooth transport of the film through the flying-spot film-pickup apparatus. Also very critical are such factors as vertical "size" and linearity of the cathode-ray tube scanning. Intelligent design of the apparatus has eliminated these troubles in practical operation; and it is safe to say that most television technologists now favor this method of film reproduction above the projection method.

As explained before, the projector-type Tv film-reproducing system depends for its success upon the storage properties of the camera tube. The picture is flashed upon the mosaic only during the vertical-retrace blanking periods to produce a latent image of electrical charges. Subsequent scanning of the latent image by a sharply focused beam of electrons removes the charges in progressive fashion to provide the video signal.

Most pickup tubes of the storage type have several undesirable characteristics as regards reproduction of the photographic densities comprising the original picture. The tendency to fog low-key scenes has been mentioned. Another defect is "shading," a spurious signal generated by electrical processes taking place in the tube, and which produces bright misty areas at the top or bottom, or at the sides of the picture. Shading can be counteracted electrically to some extent, but flying-spot film reproduction is free from defects of this kind.

Even though the adjustment of Tv-projector shutters is more critical than that of ordinary projectors, small errors causing serious image deterioration, it should not be supposed that the optical-projection process can tolerate large shutter-timing errors. The theatre projectionist, like the Tv engineer, should check the condition and adjustment of the shutter at frequent intervals.

Errors in Shutter Setting

There are four distinct errors in shutter adjustment, namely, errors of (1) timing, (2) blade-and-opening angles, (3) phasing, and (4) rotation. The brighter the picture, the more damaging become the effects of these errors.

1. Timing Errors. Assuming that the shutter blades are of the proper width, the action of the shutter may lag or lead with respect to the functioning of the intermittent movement. Most modern theatre projectors have a shutter-setting knob to facilitate adjustment of the shutter timing during the projection of pictures.

If the shutter lags, failing to cut off the light when the film begins to move in the gate, travel ghost will appear as flickering streaks radiating upward from the tops of bright objects in the projected picture.

If, on the other hand, the shutter leads, allowing the light to pass before the film has come to rest, travel ghost will radiate downward from the undersides of bright objects in the picture.

In cases where the shutter is very far out of adjustment, it may be necessary to loosen the screws holding it to its shaft and bring it around near to

(Continued on page 32)

Simplex *f*:1.7 Light Shield and Water-Cooled Trap

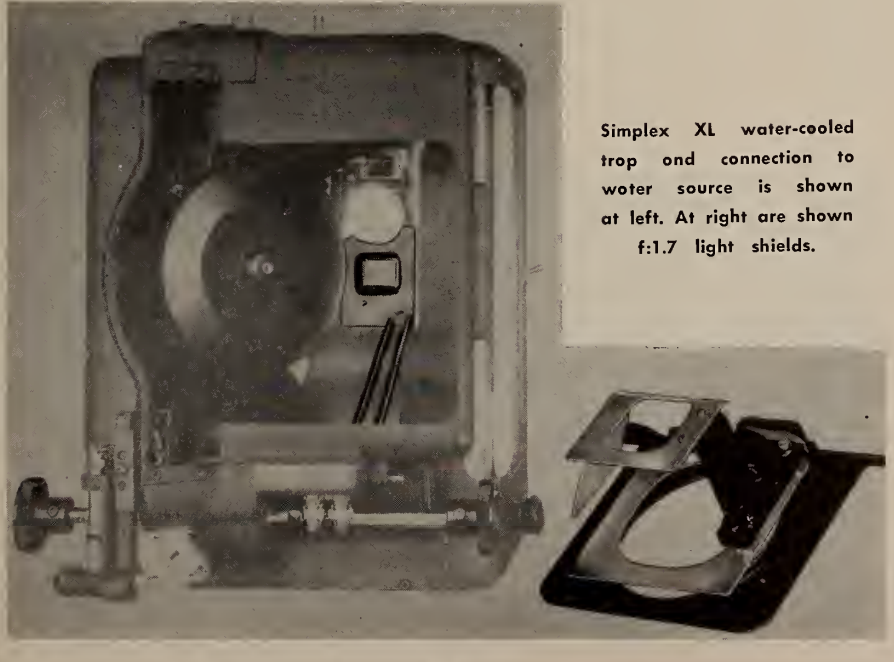
The Simplex XL projector mechanism is now available with special *f*:1.7 light shields and a water-cooled trap and aperture, National Theatre Supply announces. XL mechanisms now in use can be easily modified for *f*:1.7 use by means of adapter kits that are also ready.

The purpose of the *f*:1.7 light-shield design is to pass without any obstruction the beam of the new and faster high-intensity arc lamps now on the market. The National Excelite 135 with 18-inch reflector is an example.

The problem of increased heat at the film gate, making it difficult to thread or change apertures, is solved by the newly-designed water-cooled trap and aperture. This device makes it possible for the projectionist to work on a machine immediately after changeover.

Simplex XL mechanisms now in use can be easily modified in the field for *f*:1.7 operation. An *f*:1.7 modification kit containing the new light shields and a kit containing the new water-cooled trap are available through any National Theatre Supply office.

The standard Simplex XL mechanism will continue to be available for those theatres equipped with arc lamps that have light speeds of less than *f*:1.7 and operate at low amperages.



Simplex XL water-cooled trop ond connection to woter source is shown at left. At right are shown f:1.7 light shields.

In The

SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

RECENT Department of Labor statistics show that fewer people applied for unemployment insurance benefits during the week of August 20 last than in any week during the past two years. The national total of those drawing benefits dropped to 971,000, the first time the figure dropped to below a million since November 1953.

On the surface this figure is encouraging. It indicates general prosperity. However, workers in the motion picture exhibition field, such as members of the projectionist craft, may wonder what all this prosperity means to them. From their point of view, things don't look so rosy. Theatres are still closing and salary increases are hard to get.

The fact is that projectionists are in somewhat the same boat as the workers in the textile mill towns of New England, and in the hard coal areas of Pennsylvania. Since the end of World War II there has been a chronic high level of unemployment in these areas despite the prosperity of the country in general. Oil and gas heat for homes permanently injured the hard coal industry, and competition from cheap labor in unorganized areas cost many highly-skilled New England mill workers their jobs.

Although not regional in character, the motion picture exhibition industry has been in somewhat the same position as the coal and textile industries. It has not grown apace with other industries during the last 10 years, and is not enjoying the full benefits of the present prosperous era. Picture houses are going to be around for a long time but they are not likely to ever again achieve the position they once held as the dominant and unchallenged mode of popular entertainment. This honor will have to be shared to some extent with home Tv.

This leaves the projectionist craft facing as difficult a situation as it has ever come up against. Real and crocodile tears are even now being shed by exhibitors who sieze upon every opportunity to cut the manpower in projection rooms and to reduce salaries of projectionists. Now is the time when union solidarity is most important if the gains of the past years are to be maintained. Additional benefits will not come easily.

● The IA won another jurisdictional battle with NABET when the film editors at NBC-TV, Hollywood, Calif., voted unanimously in a recent NLRB election to affiliate with IA Film Editors Local 776. John W. Lehners, business representative for Local 776, stated that similar challenges of NABET jurisdiction will be made by IA film editors in Chicago and New York.

● *Recent out-of-town visitors to IP:* Horace Evans and Rudolph Peterson, from Local 219, Minneapolis, and A. Milligan and A. L. (Pat) Travers, Toronto Local 173, called at IP offices during the past month. We enjoy these visits with our out-of-town friends, and we always find it interesting, to say the least, to get their viewpoints on matters of general craft interest.

● The immediate need for more education for projectionists was the theme of the fall meeting of the New York State Association of Motion Picture Projectionists held October 3 at the American Legion Hall in Syracuse, N. Y. Discussion from the floor during both afternoon and evening sessions of this gathering of veteran projectionists pointed to the need for education in the following three phases of the projectionists' work:

1. Projectionists need practical information about getting the best screen results from the powerful arclamps and fast optics needed for such new processes as CinemaScope.

2. Projectionists should prepare themselves to take a more active part in theatre-Tv and closed-circuit Tv hookups, particularly those that occur outside the theatre in auditoriums and hotels.

3. An active interest should be taken by projectionists in the technique of using portable 16-mm projection equipment. It was pointed out that although this equipment is relatively simple compared with the 35-mm machines used in theatres, many projectionists seem wary of accepting extra 16-mm work because they have not taken the small amount of time required to become familiar with these projectors. It was also remarked that a considerable change will occur before long in the 16-mm field when the Zenon-type of cold light source comes into wider use.

The meeting was presided over by George F. Raaflaub, president of the Association, and Charles Wheeler, secretary-treasurer. Sitting beside them during the active and interesting forum on projection problems, were Jim Brennan, first IA vice president, and H. Paul Shay, of Local 289, Elmira, secretary-

NEW YORK STATE ASSOCIATION MEET HELD IN SYRACUSE



Opening session of the Association's annual Fall meeting which was held at the American Legion Club in Syracuse on October 3. Pictured above, left to right, are: Walter Scarfe, Syracuse L. 376; Louis B. Goler, Rochester L. 253; Charles F. Wheeler, Geneva L. 108 and secretary-treasurer of the Ass'n; George F. Raaflaub, Syracuse L. 376 and Ass'n president; James J. Brennan, IA first vice-president; H. Paul Shay, Elmira L. 289 and 10th District secretary-treasurer; Edward J. Dougherty, past president of the 25-30 Club of New York City, and John B. Smith, Syracuse L. 376.

treasurer of District No. 10. (N. Y. State).

The most vexing problem brought up at the forum was the situation of the projectionist called in to operate closed-circuit Tv equipment in hotels and auditoriums. The service engineers set up the equipment and often perform all the functions of operating.

Jim Brennan pointed out that this situation was far from the intent of the IA or President Walsh. He urged projectionists to insist on playing a proper role in all such showings. Other delegates to the meeting urged that projectionists prepare themselves thoroughly for this active role by learning all they can about operating closed-circuit Tv equipment.

At a recent closed-circuit hook-up between groups of psychiatrists with outlets in 40 cities, it was noted, only one projectionist out of 40 actually operated a complete show although 40 participated in the job under the terms of an agreement with the company that set up the closed network. Brennan emphasized again that the function of the service engineer is only to set up the equipment and instruct the projectionist. Such a division of work was actually essential, it was agreed, for the proper handling of all the details of putting on such a show.

The old problem of keeping CinemaScope magnetic tracks from coming into contact with stray magnetic fields within the projection room was also discussed. The need for non-magnetic aluminum sheeting to cover rewind tables was pointed out. It was noted by Irving Merkur, member of New York Local 306 and manufacturer of the Ace cue-marker and Ace splicing machine, that even such a tiny substance as metallic dust in the air can be ground against tracks as it goes through the machine and creates noise through the loudspeakers. The film, he stated, should be cleaned during rewinding with a velveteen pad to catch this dust.

Visitors and delegates to the Association meeting, who attended both the forum and the banquet sponsored by Syracuse Local 376, make up a list that includes many of the best known projectionists in New York State. A number of representatives of projection equipment manufacturers at the meeting included Arthur Meyer, International Projector Corp.; C. A. Lovgren, National Carbon Co.; and Roy Fisher, Fisher Mfg. Co.

The Association's Spring meeting was scheduled to be held in Binghamton, N. Y., May 8 next.

● For photography enthusiasts: The Berks Camera Club of Reading, Penna., is now accepting entries for its forthcoming 8th International Color Slide Exhibition. The closing date for all entries is April 21, 1956. For further information contact John H. Kline, exhibition chairman, 312 Raymond St., Hyde Villa, Reading.

● An agreement was reached between Local 691, Bluefield, W. Va., and the management of the Center Theatre there. Ownership of the theatre recently changed hands and the new owner discharged the IA projectionists working there. After a month's intensive picketing the new owner agreed to rehire the IA men and signed a contract calling for an increase in wages.

● James A. Whitebone, secretary and business manager for Local 440, St. John, N. B., was re-elected president of the New Brunswick Federation of Labor for the 25th consecutive term.

● September 7, 1955 is a date Miss Florence Rose, office manager for Local 165, Hollywood, Calif., will long remember for it was on that day that she was doubly honored by her co-workers. On that day the members of the Local presented Miss Rose with an engraved gold wrist watch to which was attached a $100 bill. Richard Frisbie, president of Local 165, made the presentation on behalf of the membership as a token of appreciation of her "faithful, efficient, and untiring efforts in fulfilling the many duties during the five years of service rendered to the Local, its officers, and its members."

With the cooperation of the officers of the Local, a second presentation was made to Miss Rose when Dave Narcey, acting on behalf of the 25-30 Club of New York, awarded her a gold honorary life membership card, thus making her the second woman to hold honorary life membership in the Club. Miss Rose, or "Rosie," as she is affectionately known to her many friends throughout the Alliance, worked in the IA general office in New York for 23 years prior to moving to the West Coast, serving under the leadership of IA Presidents William F. Canavan, William Elliott, George Brown, and Richard F. Walsh.

HOLLYWOOD LOCAL 165 OFFICE MANAGER HONORED



Dove Norcey, front row third from left, member of New York Local 306 and one of the founders of the nationally-known 25-30 Club of New York, is shown presenting Miss Florence Rose, office manager for Local 165, Hollywood, Calif., with an Honorary Life Membership card in the Club together with a beautifully engraved scroll. Pictured above are Local 165 members who participated in the ceremonies. Front row, left to right: Pat Offer, member of the executive board; Miss Rose; Norcey; and board members Leo Guinan and Ed Werling. Standing, rear, left to right: Harold Masser, board member; Richard Frisbie, president of the Local; Don Kloepfel, board member; Allen Pullene, secretary-treasurer; Ed Higgins, business representative; board members Hugo Hawley and Dwight Maore.

● A. L. Cash, business representative of Local 646, Ft. Lauderdale, Fla., for the past 25 years, was recently elected president of the Brownard County Central Labor Union. Cash organized the Local back in 1923 and has served in an official capacity since that time.

● Eddie Stewart, member of New York Local 306, was reappointed to the New York State Workmen's Compensation Board.

● The H. Paul Shays of Local 289, Elmira, N. Y., celebrated their 30th wedding anniversary on September 29. Our very best wishes for many more anniversary celebrations.

Another Anamorphic Process

Don't get frightened, but another Hollywood studio has come up with a new wide-screen anamorphic process. The studio is Republic, and the process is known as Cinepanoramic. The studio stated that Cinepanoramic prints could be shown with all presently-installed anamorphic projection equipment.

Count Them! 15 Different 35-mm Release Prints

Continuing experiment and innovation are necessary to the health and prosperity of the motion picture industry, but confusion can strangle progress and defeat the purpose of long-needed changes.

DO YOU have any idea how many different types of release print are now in distribution or supposedly scheduled for distribution to theatres shortly? Well the number is *fifteen*, and that includes only 35-mm prints. Horizontal, or 55- or 70-mm or other off-size prints for roadshow presentations are not included in the above tabulation. The 15 types include only 35-mm release prints presumably intended for general distribution.

In case anyone doubts that 15 different varieties of print exist, he can take a look at the accompanying table prepared by the Motion Picture Research Council of Hollywood, Calif. It is true, of course, that some of these prints differ from others only slightly, but the differences exist and a variety of sound equipment, lenses, apertures, etc., are required to project them.

In an attempt to reduce the confusion resulting from this wide difference of opinion among the studios as to what the characteristics of a release print should be, the Research Council has classified these various types of print and recommended identification practices to exchanges so that a print can be instantly recognized by projectionists.

The recommended identification practices include labeling the reel bands of each type of print so that a projectionist can tell whether a print is anamorphic or non-anamorphic, whether it is a non-squeezed print designed for wide-screen, and, if so, in what aspect ratios it may safely be projected.

Also included will be information as to the degree of squeeze used in making anamorphic prints. At present, all available anamorphic prints have the 2 to 1 anamorphic squeeze ratio used for CinemaScope, but Paramount announced some time ago that it would make available VistaVision anamorphic prints with a squeeze ratio of 1.5 to 1.

The labels will further contain a description of the sound track or tracks on the film, noting whether they are magnetic or optical, and, if optical, whether they contain sound cues for the Perspecta stereosound system.

RELEASE PRINT ASPECT RATIOS AND EQUIPMENT REQUIREMENTS

Process	Anamor. Ratio	Max. Aper. Dimensions[1]	Aper. Aspect Ratio	Max. Screen Aspect Ratio[1]	Type of Sound	Integrator Pre-Amp.	Pre-Amp.	Main Amplifier	Stage Speakers
CinemaScope	2:1	0.912 x 0.715	1.275 to 1	2.55 to 1	4 tr. mag.[4,5]	No	4	4	3
CinemaScope	2:1	0.912 x 0.715	1.275 to 1	2.55 to 1	1 tr. mag.[4]	No	1	1	1
CinemaScope	2:1	0.839 x 0.715	1.175 to 1	2.35 to 1	Optical	No	1	1	1
CinemaScope	2:1	0.839 x 0.715	1.175 to 1	2.35 to 1	Opt.direct.[6]	Yes	3	3	3
CinePanoramic	2:1	0.912 x 0.715	1.275 to 1	2.55 to 1	4 tr. mag.[4,5]	No	4	4	3
CinePanoramic	2:1	0.839 x 0.715	1.175 to 1	2.35 to 1	Optical	No	1	1	1
SuperScope	2:1	0.715 x 0.715	1 to 1	2 to 1	Optical	No	1	1	1
SuperScope	2:1	0.715 x 0.715	1 to 1	2 to 1	Opt.direct.[6]	Yes	3	3	3
VistaVision	1.5:1	0.825 x 0.740	1.115 to 1	NOTE 3	Optical	No	1	1	1
VistaVision	1.5:1	0.825 x 0.740	1.115 to 1	NOTE 3	Opt.direct.[6]	Yes	3	3	3
VistaVision	none	0.825 x B[2]	NOTE 3	NOTE 3	Optical	No	1	1	1
VistaVision	none	0.825 x B[2]	NOTE 3	NOTE 3	Opt.direct.[6]	Yes	3	3	3
3-D double	none	0.825 x B[2]	NOTE 3	NOTE 3	Optical	No	1	1	1
Wide screen	none	0.825 x B[2]	NOTE 3	NOTE 3	Optical	No	1	1	1
Wide screen	none	0.825 x B[2]	NOTE 3	NOTE 3	Opt.direct.[6]	Yes	3	3	3

[1] NOTE 1: Aperture dimensions and screen aspect ratio are specified at 0° projection angle.

[2] NOTE 2: B will be 0.600" at 1.375 to 1 aspect ratio. Other aspect ratios will require the following dimension for B:

1.66 to 1	B = 0.497"	1.85 to 1	B = 0.446"
1.75 to 1	B = 0.472"	2.00 to 1	B = 0.412"

[3] NOTE 3: On these prints the maximum and minimum aspect ratio in which the picture can be shown is given. The minimum aspect ratio defines the projector aperture ratio below which the frame lines will show. The maximum aspect ratio defines the projector aperture ratio above which significant action will be lost.

[4] NOTE 4: These types of release prints require a magnetic sound head and sprockets for CS narrow perforations. All other types use an optical sound head and sprockets for standard perforations.

[5] NOTE 5: This type of release print requires surround speakers.

[6] NOTE 6: Perspect-A-Sound is now the only type of directional sound available.



More on C'Scope Trailers

To the Editor of IP:

I noted with interest the article about CinemaScope trailers on page 16 of the May issue of IP. They are my only worry in this new setup.

I figured out a simple way for projectionists not having retainer rings to mark the position of the lens when changing from widescreen to CinemaScope. (We have standard Simplex heads, variable anamorphics, and 4½-inch E.F. widescreen lenses.) Here is what I marked my widescreen lenses and CinemaScope "back-up" lenses with:

After focusing by hand, I placed a strip of white half-inch adhesive tape around the barrel, marking the tape at the front edge of the projector case or head. Then when I put the lens in, I slip it to that mark; and the picture nearly always comes on in focus. Simple? Projectionists who find the picture badly out of focus on changeovers might like to try this method.

I wish to know why so many projectionists run the volume so high with both magnetic and optical sound. I have heard numerous complaints about excessively loud sound.

In regard to the complaint appearing on page 26 of the May issue anent out-of-focus pictures, I wish to say that I have had no trouble obtaining a sharp CinemaScope picture. All I do is keep the lens clean and focus it carefully.

Our aspect ratio is 1.75/1 for widescreen and 2.33/1 for CinemaScope. I have been highly complimented on my good-looking screen — sharp and bright with sound volume more pleasing than that heard in many larger towns. We have a throw of 90 feet, a 12-foot by 23½-foot silver screen, and are using 45-amp. Motiograph arc-lamps and Simplex sound.

Technicolor's practice of mounting an 85-minute feature on six reels instead of five seems crazy to me. Also, there is too much variation in the volume of their sound-tracks.

ALBERT POWERS

Ashland, Kansas

EDITOR'S REPLY: It is always a good idea to position-mark the barrels of all the different lenses which are interchanged during projection. Nevertheless, some form of mechanical stop, such as retainer rings, is preferable for minimizing incorrect focus when changing over to a machine in which the projectionist has inserted a different lens. Retainer rings save time and eyesight, and they automatically eliminate accidental errors in resetting the lens.

Adhesive tape is satisfactory only if the lens barrel never gets warm enough to soften the adhesive and allow the tape to creep — which is very likely to happen. Metal-marking lacquer of the type used by machinists is relatively permanent and, of course, immovable. Some projectionists prefer scoring the lens barrels by means of a sharp steel instrument. We do not approve of scoring because the scratches, once made, cannot be removed for correction at some later time.

Keep Watching Focus

Frequent "touching up" of the focus by hand is *absolutely essential* to sparkling clarity of the picture at all times. This is especially true when lenses of shorter E. F. than 4 inches are used. Even lenses in the 4- to 6-inch range show up the effects of focus-drift sufficiently to demand constant attention on the part of the projectionist. Slightly different settings are also required when changing from black-and-white to color, or from nitrate film to safety film.

Theatre patrons are more annoyed by blurriness of the screen image than by any other projection defect. Like other skilled projectionists, Mr. Powers considers his audiences and devotes constant attention to lens focus. The few "operators" who seldom touch the focusing knob have given the entire craft a bad name.

Projectionist complaints of poor focus are aimed at the photographic quality of the prints, both regular and CinemaScope. Any film can be focused sharply on the screen, but if the picture on the film is out of focus, the projected picture will also be out of focus. In such cases any scratches present in the emulsion will look clear while the picture, itself, looks blurry. Far too many release prints have slightly "fuzzy" image definition — just blurry enough to interfere with the enjoyment of patrons seated in the first 15 or 20 rows.

Mr. Powers' dissatisfaction with short feature-film reels is justified. (Remember when *all* features were shipped on "single" reels?) An 85-minute feature comprises 7,650 feet of film. This is practically an 8-reel feature, and probably could have been mounted on 4 "double" reels, each holding close to 2,000 feet of film.

Reel divisions are made on fades whenever possible; and, of course, a cut in the middle of a camera shot is inadmissible. But single camera shots are rarely longer than 200 feet of film, and most of them are only from 10 to 75 feet long.

Overloaded Reels

Reels should never be overloaded, for film damage may result if the outer turns should accidentally slip off and unwind. That is why most exchanges prefer to wind slightly *less* than 2,000 feet of film on a double reel. But even if 18 minutes of playing time (1,620 feet) is the preferred length for a double reel, an 85-minute feature could easily have been divided up among 5 reels, each averaging only 1,530 feet (17 minutes).

Optical soundtracks on Technicolor prints are ordinary silver images printed and developed *before* the colored pictures are applied to the blank frame areas. The troublesome volume variations can therefore be traced to the sound negatives, the preparation of which Technicolor ordinarily has nothing to do. The same variations would have appeared in a black-and-white print.

Another Blow at Mr. Connor

To the Editor of IP:

Methinks Mr. Edward Connor "don't know from nothin!" Your answer to his letter published in the August issue of IP should necessitate his sending in a retraction. However, I think you overlooked another flaw in his would-be argument. You could have called his attention to the fact that he apparently knows nothing about Tv sets either, or he would know that a Tv owner has no control over the focus of the picture. This can be performed only at the transmitter on the sharpness of the horizontal scanning lines.

L. C. RODERICK, Local 150

Alhambra, Calif.

EDITOR'S COMMENT: In our anger at Mr. Connor's irresponsible accusations, we overlooked this further example of what seems to be a complete disregard for fact.

Fox Reports on 55-mm Plans

20th Century-Fox announces that there may be special roadshow performances of its forthcoming film, "The King and I," using 55-mm CinemaScope prints and special projectors. There is no definite information available as yet on how much emphasis Fox will place on 55-mm CinemaScope prints, but it is believed certain that most CinemaScope photography will soon be done on 55-mm negatives. These large negatives would be reduced during printing to 35-mm size.

Report from SMPTE Convention

A NUMBER of improvements in theatre projection and sound equipment were reported in technical papers read at the semi-annual convention of the Society of Motion Picture and Television Engineers, held early this month at Lake Placid. Brief synopses follow of some of the papers which are of particular interest to the projection craft:

Polyester Photographic Film Base

D. R. WHITE, C. J. GASS AND E. MESCHTER
E. I. du Pont de Nemours & Co., Inc.

Properties of "Cronar" polyester photographic film base are outlined. The utility and importance of these characteristics in the use of photographic films, especially motion picture films, are discussed. Optical clarity, high wear and tear resistance, low moisture sensitivity and relatively high stiffness modulus combine to make this base an excellent one for general use, and particularly useful in certain demanding situations.

Todd-AO Motion Picture System

BRIAN O'BRIEN
American Optical Co.

The Todd-AO System utilizes either 65- or 70-mm film of identical perforation operating at 30 frames/sec. Cameras weigh only slightly more than corresponding 35-mm units, and are equipped with a complement of lenses of angular coverage ranging from 16° to 132°, with relative aperture ranging from *f*/2.8 to *f*/2.0. Picture aspect ratio is approximately 2 to 1, and projection is upon a large deeply curved screen with sagitta *(depth of curve)* approximately ¼ the chord *(straight line that touches left and right edges of curved screen)*.

The screen is illuminated by a single projector located in the rear of the theater, and of relatively conventional design with certain special features and special projection lenses to achieve very high quality images from the large film. Composite sound is provided by six high quality magnetic channels.

New Concepts of Perspecta Sound and Projection Control Practice

R. A. HAINES
Army and Air Force Motion Picture Service

Development concepts and assembly details are described for new custom-designed perspecta integrators and projection control devices being employed throughout the largest overseas American military theater circuit serving in the Far East.

Featuring capability of full-time employment of 3-channel directional sound reproduction in operation from any photographic film-track or other signal source, the integrators combine provisions for simplified operation, complete emergency switching to prevent sound failure, and extreme service accessibility. The new semi-automatic dual push-button controller is an original, unique idea which achieves maximum centralization of all operational controls. More than one hundred sets of these equipments are being installed in Far East Army and Air Force Theaters.

Perception of Color in Projected and Televised Pictures

D. L. MAC ADAM
Eastman Kodak Co.

Many color photographs are taken in daylight and projected with tungsten lamps. On the other hand, commercial motion pictures made with tungsten studio lamps are almost always projected with arcs that resemble daylight.

Color television receivers produce "white" of daylight quality or even bluer, although most of the scenes televised are tungsten-lighted. Hence the question: "How should a color in one quality of illumination be reproduced for viewing with some other quality?" An investigation undertaken to answer this question will be described, and the results will be discussed.

Analysis of the behavior of the eye seems to indicate that human color vision is served by at least four and probably by five or even six different photosensitive processes, having different spectral sensitivities and different degrees of adaptation to various qualities of illumination.

These findings do not call into question the trichromatic character of color perception, on which color photography and color television are based. Apparently the visual nervous system provides only three channels, capable of handling only three independent responses. But each of these responses appears to be stimulated by a combination of two or more photosensitive processes in the eye.

Optical Multiplexing in Television Film Equipment

A. H. LIND AND B. F. MELCHIONNI
Radio Corporation of America

The primary reason for multiplexing Tv film cameras and Tv film projectors is economy of equipment and/or space. A further reason can be the insurance of standby protection, at a nominal cost, when continuity of programming assumes a high order of importance.

TESMA Forum Will Take On All Technical Questions

Discussions of the new 20th Century-Fox 55-mm film and projection process and the final form of the Todd-AO system will be features of the equipment forum to be held as part of the TESMA Convention and trade show or projection equipment at the Morrison Hotel, Chicago, from November 6 to 9. In addition, the forum panel will answer questions on projection equipment in general that are presented from the floor.

Invitations to lead the discussions of their respective processes have been extended to L. D. Netter, Jr., for Todd-AO, and to Earl J. Sponable, 20th Century-Fox technical director. The forum will be moderated by TESMA vice president L. W. Davee, of the Century Projector Corp., an acknowledged expert on the projection of the big film frame and one of the developers of the old 70-mm Grandeur projection method. His company is the manufacturer of the projectors for Cinerama and Paramount's double-frame horizontal projectors.

Plans are to solicit in advance of the forum the "most asked" questions of projectionists and exhibitors so that forum experts will be able to start the ball rolling by commenting on immediate technical problems.

The panel members will not be asked to prepare or to read papers on the various phases of theatre equipment in which they are experts. They will devote their time to informal comment and to answering questions. Only two papers, one on the Fox 55-mm process and the other on Todd-AO, will be read. Questions on these processes will be answered by Sponable and Netter or their designated representatives.

The equipment forum has been set for the afternoon of Wednesday, November 9, so that theatre men who have attended the show on any previous day may get answers to questions that came up when they examined the equipment on the trade show floor.

In addition to those mentioned above, other members of TESMA invited to be members of the panel and answer questions from the floor are: Fred Aufhauser, Projection Optics Co.; Al Boudouris, EPRAD Corp.; J. A. Fetherston, Kollmorgen Optical Co.; Arthur Hatch, Strong Electric Corp.; Francis Keilhack, Drive-In Theatre Mfg. Co.; Fred C. Matthews, Motiograph, Inc.; Arthur Meyer, International Projector Corp.; V. J. Nolan, National Carbon Co.; J. F. O'Brien, RCA, and Leonard Satz of Raytone Screen Co.

PERSONAL NOTES

JOHN L. BRADLEY has been appointed assistant advertising and sales promotion manager by the Ampex Corp., Redwood City, Calif., manufacturer of theatre sound systems and other electronic equipment. A graduate of Stevens Institute of Technology, he was formerly associated with Magnatran, Inc., Kearney, N. J., producer of transformers.

* * *

DR. CLARENCE E. LARSON was named vice president in charge of research by the National Carbon Co. He was formerly director of the Oak Ridge National



Dr. Clarence F. Larson

Laboratory, operated for the Atomic Energy Commission by Union Carbide and Carbon, parent company of National Carbon.

Dr. Larson will head all National Carbon research activities including research in new physics and will be a member of Union Carbide's research committee. His headquarters will be in Cleveland, Ohio, at the company's new research laboratory now under construction. A graduate of the University of Minnesota, he received his Ph.D. from the University of California.

DR. L. M. CURRIE, formerly vice president in charge of research, has been advanced to a new post involving production, development and research.

* * *

DR. WILLIAM H. VINTON, a chief supervisor at Du Pont's Photo Products Department plant in Parlin, N. J., has been named product manager in charge of new product development in Wilmington, Del. Dr. Vinton joined Du Pont as a research chemist in 1943. He transferred to Photo Products in 1947 as a research group leader at the Parlin labs.

Census of Movie Business

The most comprehensive census of the motion picture business ever made will be released by the Federal Census Bureau at the end of the year. Millions of statistics have been collected on wages, dividends, cost and incomes for every phase of the business from production to exhibition and even popcorn concessions.

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The Future of Magnetic Sound

The battle lines are still drawn and there is no sign of a truce flag anywhere. In July, IP printed some comment by Lorin D. Grignon, 20th Century-Fox development engineer, on the efficiency and endurance of magnetic sound tracks. We then added a few words of our own in rebuttal. In the following letter, Mr. Grignon rightfully questions one of our points. We continue to take issue.

Dear Sir:

I notice that you published my recent letter to you in the July issue of IP. You added a considerable amount of comment and, again, I find much of it in error.

All producers of CinemaScope magnetic release film make these prints by a direct rerecording process and not, as you state, by passage at high speed through a high-frequency magnetic field. Very little loss of sound quality results by the method of printing used.

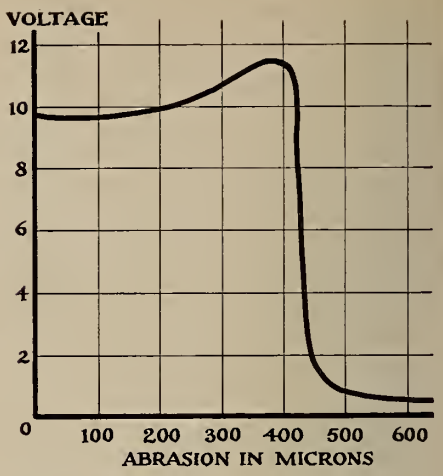
On page 17 is reproduced a graph which by implication explains to your apparent satisfaction, loss of 8,000 cycle response of CinemaScope magnetic tracks as a result of abrasion. The caption associated with the figure is not entirely clear. If, for example, the graph applies to wear of the magnetic tracks, then it is grossly in error, since the magnetic material on the release film is only 15 to 16 microns in thickness.

Our experience is that the release film is so badly mutilated by tears and breaks before the magnetic tracks are significantly worn that there is little need to be concerned about the life span of the magnetic material under prevailing conditions.

On the other hand, if the figure applies to magnetic reproducing head wear, then the data is still subject to question because our experience differs by a factor of 10 to 1; we have tested many heads and all are better than the data given in the figure.

It is meaningless to give data of this kind without full specifications of the head which was used for the test because the results will depend upon the cross section dimensions of the core material, the kind of material, the film tension, and the uniformity of the gap dimensions as wear progresses. If a head is well constructed, properly designed, and uses appropriate materials, we know from actual theatre use that such a head will outwear some projection machine parts. Optical soundhead equipment demands periodic replacement of such devices as exciter lamps, photo cells, rectifiers and rollers, and it certainly seems reasonable that the theatre can periodically replace magnetic heads approximately once a year.

LORIN D. GRIGNON
Development Engineer
20th Century-Fox



The above chart shows how the output of a magnetic reproducing head changes through wear. The voltage values on the left show the changes in output voltage as wear increases and a test loop is run through the reproducer. Various degrees of abrasion are indicated in microns at bottom. As thousands of feet of film abrade the pole pieces, gradually wearing them down, the magnetic head at first becomes slightly more sensitive, raising output voltage by a volt, and then abrasion quickly renders the device unfit for further use. When 500 microns (about 0.0197 inch) have been rubbed off the poles, the output of a 90%-modulated 8,000-cycle track drops from more than 11 down to less than 1 volt. Distortion of the sound sometimes accompanies the drop in output voltage. No time element is indicated in the graph because head wear varies greatly according to the material used.

Further IP Opinion on Sound

WE STAND to be corrected anent the statement that "Fox prints its magnetic tracks at high speed *via* passage of the master copy and the unmodulated print track through a high-frequency magnetic field . . ." As Mr. Grignon points out, direct re-recording is used for CinemaScope prints; and we are confident that the correctness of the latter part of our statement (". . . a method which does not give as good results as re-recording on the print tracks") is adequately indicative of the relatively high quality of the magnetic tracks on 20th Century-Fox CinemaScope prints.

Our error in this respect is attributable in part to an incorrect report emanating from the West Coast, and in part to a mistranslation occurring in the English-language edition of an article by one of the foremost sound technologists of Germany. The translation reads as follows:

"Under the effect of the alternating magnetic field, the adjustment of the magnetic particles is transferred from the 'mother' tape to the 'daughter' tape. On account of the high speed with which this method can be worked it is very economical *and therefore widely used.*"

The phrase "and therefore widely used" does not occur in the original article written in German.*

The graph mentioned by Mr. Grignon was issued by the manufacturing firm of Zeiss Ikon AG. of Stuttgart, and refers to abrasion of the *average* type of CinemaScope quadruple-track magnetic head by the friction of moving film rubbing against the pole pieces and gap foil. The character of the graph, we assumed, was sufficiently well indicated by the calibrations which run up to 600 microns. It could not be used to chart wear on a substance only 16 microns thick when new.

We find this graph representative of the response characteristics of the "average," or "normal," type of commercial CinemaScope head as wear progresses, and this irrespective of quality and life expectancy. By no manner of logical reasoning can this graph be interpreted as an adverse

*, , Unter dem Einfluss des magnetischen Wechselfeldes ubertragt sich dann die Ausrichtung der magnetischen Partikel des ‚Mutterbandes' auf das ‚Tochterband.' Wegen der mit diesem Verfahren erzielbaren hohen Kopiergeschwindigkeiten ist das Verfahren besonders wirtschaftlich." (Aus , , Magnettontechnik" von Dr. Thiele in Bild und Ton, Nr. 34, Seite 11.)

reflection upon any make of magnetic reproducing head.

All of the factors mentioned by Mr. Grignon *with the exception of film tension* influence the shape of the curve; but we have not yet discovered any significant variation in the response characteristics among the various makes of heads in wide use. It should be obvious that profound manufacturing variances in, for instance, magnetic reluctance and gap width would make it electrically unfeasible to interchange the several makes of magnetic heads and preamplifiers, as can now be done with most commercial equipments.

Description Is Accurate

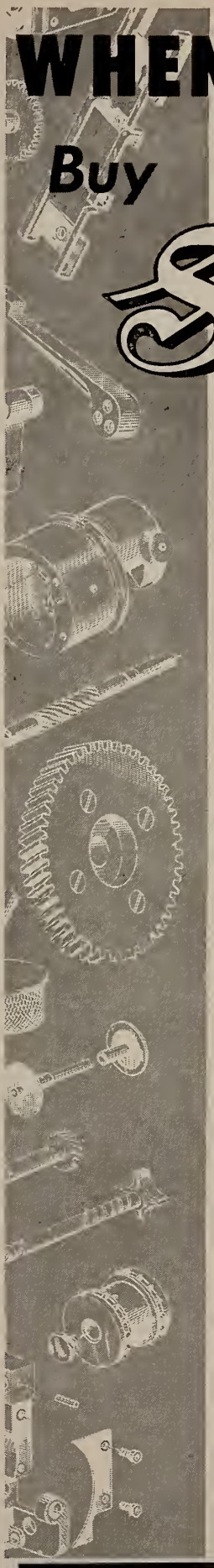
It must be pointed out that the caption for the graph is our own, not the original one.** We believe, however, that our caption reliably describes actual operating conditions with the possible exception of a few of the later heads which utilize radically different materials for prolonged life. In much less than a year, *with normal use*, a voltage-output drop following a slight progressive rise in response is experienced with the *average* CinemaScope head.

But perhaps our indicating head life by the dimension of time is too ambiguous—the number of feet of film which the head is able to reproduce satisfactorily is a better one. Here we find that the *average* head subjected to *average* film tension will reproduce approximately 3,000,000 feet of film before pronounced abrasion and accompanying drop in output renders the device unfit for further use. This represents from 6 to 8 months of service with 4 days of CinemaScope feature-film projection per week, 3 shows per day.

Some of the later heads made of longer-wearing materials will last for 4,000,000 to 6,000,000 feet of film—about 9 or 10 months of service at the minimum, 14 or 16 at the maximum. In many cases, however, the harder materials have undesirable magnetic properties and scratch the magnetic tracks. This is by no means true of all long-life heads; and the scratches inflicted upon the magnetic oxides of the tracks seldom introduce noise or distortion in the reproduced sound.

We cannot subscribe to the view

**, , Pegelabfall des Vierfachmagnetkopfes." "Slope of quadruple magnetic head."



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held by the proponents of magnetic soundtracks *for theatre release prints* that such tracks are either stable under the conditions of everyday theatre use or immune from magnetization changes which interfere with the quality of the sound. In spite of the small number of theatres equipped to play CinemaScope magnetic tracks, loss of signal strength (especially in the high-frequency end of the sound spectrum), volume variations from foot to foot and from track to track, and the pick-up of machine noises are fairly common phenomena.

The use of magnetic tracks *on release prints* also contributes to physical mutilation of the film—torn sprocket holes and scratches on the picture area being the most frequent complaints. Even though stereophonic sound reproduction may or may not be artistically desirable in motion pictures, the advocacy by Fox of magnetic tracks *on release prints* for single-channel reproduction is open to question. Optical sound is very well suited for monaural motion-picture sound, and, for that matter, is readily adaptable physically to pseudostereophonic and "2½"-channel stereophonic reproduction (Perspecta Sound and PhotoStereo Sound).

This writer knows of no projector-mechanism part which does not outlast any CinemaScope magnetic head on the market today. Even an intermittent sprocket subjected to the rapid-wearing effect of excessive film tension will last a couple of years if reversed to make use of both sides of the sprocket teeth.

The periodic replacement of such optical soundhead components as exciters and photocells involves no very great expense, and cannot reasonably be compared costwise to the replacement of magnetic reproducing heads. No optical soundhead has as many, or such expensive, rollers as a CinemaScope head, as the writer well knows by experience.

Theatres Expected to Hold Attendance Gains

Although motion picture attendance fell slightly during the second quarter of 1955, the increased number and wider use of drive-ins during the third quarter is expected to push attendance figures to a higher level later this year.

Attendance at drive-in motion picture theatres has now reached a point where it is as great during the peak summer months as the attendance at four-wall houses, despite the fact that the hardtops far outnumber the drive-ins.

Total attendance at all theatres for the year 1955 is expected to be about 50,000,000, according to Standard & Poors, the Wall Street statistical firm. The gross take at American theatres, less admission taxes, is expected to be about $1.3 billion, a slight gain over last year, but the major circuits are not expected to profit further by this increase in gross. Their profits will be about the same as last year, the financial firm predicted. Fewer theatres in operation, plus higher film rentals and other operating costs, will restrict profits, it was predicted.

Studios in Good Position

Summing up, Standard & Poor's finds:

"Increased production of feature motion pictures, coupled with this new television business, has stimulated activity at most film studios, permitting greater utilization of personnel and facilities.

"Film rental rates are averaging higher. Moreover, improved attendance abroad and less stringent currency restrictions will probably permit somewhat larger 1955 foreign revenues.

"Thus, earnings by motion picture producers are likely to run moderately higher on average, although results of individual companies may vary widely."

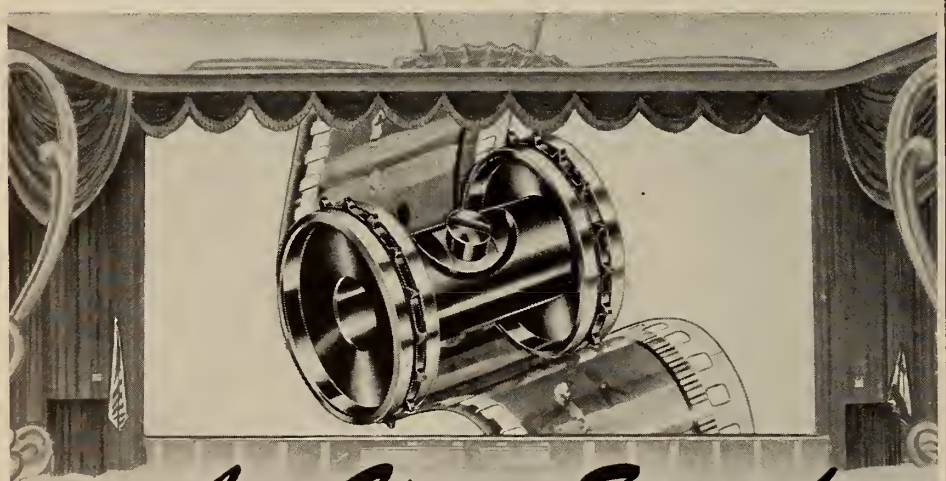
Pay-Tv Caught in Legal Snarl

The question of whether the exhibition industry is going to be faced with further competition from pay-as-you-see Tv is now snarled in a complicated legal muddle. Washington sources say that it is not likely that any decision will come before 1956, or any real action before 1960 if the decision favors the coin-box Tv interests.

A stack of bound volumes, which would stretch to a height of 22 feet contains the reply of motion picture exhibitors and others to the invitation of the Federal Communications Commission to speak out on objections to the pay-as-you-see Tv proposals. These replies fill 68 volumes, each four inches thick.

Expand Fleetwood Tv Sales

Distribution of the Fleetwood TV projector in the Southeastern states is now being handled by Hoover Enterprises, Inc., of Miami.



. . . Are Your Sprockets Showing? . . . They sure are if they're worn—and your patrons won't approve! To stop that very annoying film jump caused by worn parts, have your projectors overhauled using the finest parts throughout—LaVezzi, of course! Your Theatre Equipment Dealer has them.

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Ray Brian—Motion Picture Historian

WE present here the fourth installment of Ray Brian's fabulous collection of motion picture projection equipment and data, which he amassed over a period of many years of painstaking and intensive research.

A member of Local 434, Peoria, Illinois, Brian is constantly seeking to make new additions to his already extensive collection. With the exception of those listings marked here with an asterisk, he has photographs, and in many instances, physical possession of the equipment listed. IP readers having additional data are urged to contact Ray Brian through this publication.

Following is the listing for this month:

ECLIPSE—Goumont British Co., London, England, 1928-1935.

EDISON—"Kinetoscopes", 1889-1914.

EDISONOGRAPH—Edison's spool-bonk projector of 1896.

EDENGRAPH—Froncis B. Connock, 1899.

EDUCATIONAL— . . . *

EDUCATOR—mode in St. Louis, Mo., obout 1920.*

EFFICIENCY— . . . *

ELGE—French Goumont Co., 1910.

ELECTRASCOPE—before 1900.*

EMPIRE—W. Butcher ond Sons, London, Englond, 1911.

EIDOLOSCOPE—Lothom's 2nd mochine, 1895.

ERAGRAPH—Haydon ond Urry, London, Englond, 1896.*

ERKOSCOPE—. . .*

ERNEMANN—Zeiss-Ikon, Germony, since 1910.

ERNON—mode in Germony by Ernemann, 1934.

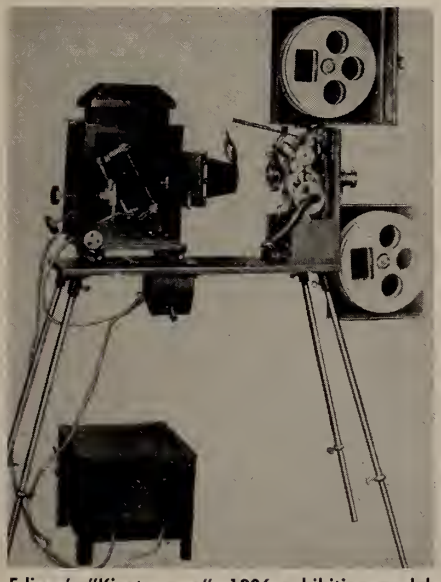
ERKO—mode in Germony by Moschinenbau obout 1928.

ERTEL—made in Germony, 1910.*

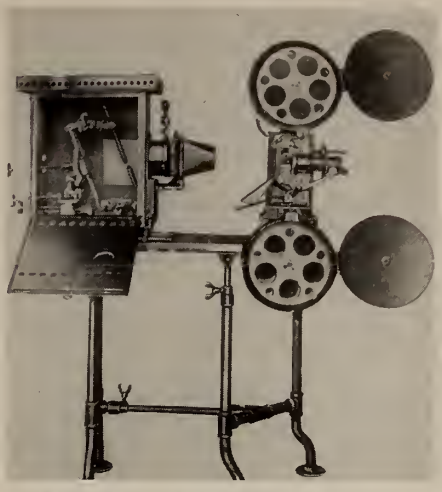
EUREKA—mode by Webster ond Kuhn, 1897.

EUREKA—made in Fronce, 1899.*

EUREKA—made by Pio Pion, Milono, Itoly, 1952.



Edison's "Kinetoscope"—1906 exhibition model.



1914 model of the Edengroph motion picture projector (forerunner of the Simplex).

EURO—mode in Germany by A. E. G., obout 1930.

EXCELLOGRAPH—Elios P. Dunn, 1898.

EXCELSIOR-BLOC—mode by Lavol, Paris, France, 1931.

EXCELSIOR—mode by P. Malinverno, Milano, Itoly, 1953.

F ond H—made by Frieseke and Hoepfner, Germany, 1953.

PONOCINEX—mode in Brozil.

FULCO—E. E. Fulton Co., Chicogo, Ill., Ernemonn #5 Mechonism.

[TO BE CONTINUED]

Atom Next Cinerama Subject

Peacetime uses of atomic energy will be the theme of a new Cinerama feature now in production. The film is being made with the technical assistance of the Atomic Energy Commission. It is expected by Cinerama, Inc., to attract an audience as high as 100 million after it is released some time in the second half of 1956.

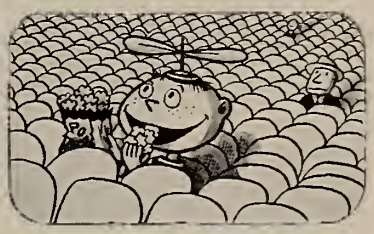
Production plans differ from previous Cinerama features in that a standard 35-mm negative will be photographed at the same time as the Cinerama triple negative. Standard prints will be released overseas, and probably in isolated areas of the United States.

German Union May Make Films

DGB, a West German labor organization has announced a plan to enter the motion picture production business by buying a 33% interest in the Ufa studios, the largest producing organization in the German film industry. Ufa is now owned by the Bonn government and will soon be sold.

The union announced further that it would work for lower film production costs for German films after it buys into Ufa, and that it will also start a campaign for lower admission prices at German theatres. German film producers are said to be considerably disturbed over the announcment.

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Nation's Theatres Increase Slightly (7 more)

A recent survey of the number of theatres operating nationwide at the midpoint of this year indicates that the exhibition industry is continuing to hold its own. An increase in the number of drive-ins more than offsets a decrease in active four-wall theatres. The result was a small net gain of seven theatres during the six-month period ending July 1.

According to a survey made for the Committee of Motion Picture Organizations, there were 14,724 active four-wall theatres and 4,384 drive-ins as of July 1, a total of 19,108. This is the largest number of theatres in operation since 1946, and represents a net gain of 1,644 from the low point reached in March, 1954, just prior to Federal tax relief.

At the end of 1954, there were 15,039 active four-wall theatres and 4,062 drive-ins, a total of 19,101, according to the tabulation which was prepared for COMPO by the Sindlinger research organization.

During the first half of this year, there were 900 closings of four-wall theatres, while 585 new and reopened theatres were activated. Thus, the net loss in four-wall houses was 315.

In the same period there were 387 new drive-ins constructed, while 65 were closed permanently or abandoned. About 20 of the new auto theatres replaced closed drive-in operations.

Included in the "active theatre" list, as of July 1, are seasonal theatres and an undetermined number that operate only part of each week. Of the 594 seasonal theatres, 275 operate only in the Winter and 319 only in the Summer.

A state-by-state tabulation of active theatres shows that Texas leads the country with a total of 1,427 of which 465 are drive-ins. New York is second with 1,166 theatres of which 143 are drive-ins, and is closely followed by California with 1,089 theatres of which 195 are drive-ins. Pennsylvania follows with 1,063 theatres of which 214 are drive-ins.

Compact Portable Camera For Closed-Circuit Tv

Wider and wider use is now being made of small portable Tv camera units such as those shown in the accompanying illustration. This is the type of



Portable Tv Camera Equipment

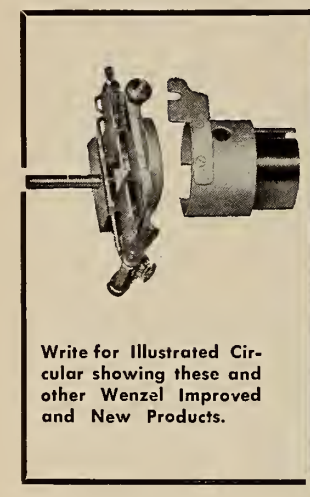
equipment needed on the taking end of a closed-circuit Tv hookup operating within a hotel or industrial plant.

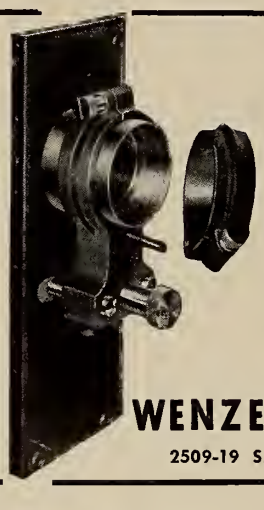
The basic units shown include a camera equipped with a small but sensitive Resistron tube, a tripod, and at bottom from left to right, a portable control panel, a remote control switch box, and a monitor. The camera itself is 8½ inches by 6 inches by 3½ inches, and its tube is small enough to take the standard lenses of 35-mm cameras.

The units shown are manufactured by the electronics division of the Curtis-Wright Corp., Wood-Ridge, N. J., one of a number of manufacturers who produce similar equipment. Combined with portable Tv projectors, such as those made by General Precision Laboratory and the Fleetwood Corp., this camera can be used to carry a show, meeting, or other program from a hotel room to a ballroom, or to hook meeting rooms together in handling overflow crowds.

Paris Technicolor Lab

A complete Technicolor film laboratory has been built at Joinville in the suburbs of Paris and is now operating.





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SMPTE Technical Courses Begin in Los Angeles

Three courses of instruction for film industry technicians sponsored by the Society of Motion Picture and Television Engineers, in cooperation with the University of California, got underway last month in Los Angeles. The courses are expected to help meet the growing need for trained motion picture technicians.

The three eighteen-week courses on "Motion Picture Laboratory Practice," "Duplication of Color Motion Pictures," and "Illumination Optics" grew out of the cooperative efforts of representatives of universities, labor unions, studios and laboratories to develop a program of technical instruction.

The program is under the direction of Dr. John G. Frayne, of the Westrex Corp., president of the SMPTE, and Sidney P. Solow, of Consolidated Film Industries. The courses will be conducted by acknowledge experts in their fields, and additional courses will be added early next year.

RCA Opens N. Y. Repair Shop

Opening of new facilities in New York City for the repair, modification and overhaul of motion picture projection and other RCA commercial and industrial electronic equipment has been announced by the RCA Service Co., Inc. The shop is located at 419 West 54th St. It supplements present facilities in Camden, N. J., and will serve RCA equipment users in the New York metropolitan area.

Kodak Pro Film Sales Up

Eastman Kodak Co., which this year is observing its 75th anniversary, reports that during 1954 its total sales were $633,457,838, with sales of professional motion picture film accounting for 11% of this total, as compared with only 9% in 1953. Wide gains were registered in color film and Tv film sales.

Better Film Predicted

Lab processing of both black-and-white and color film will soon become much quicker and simpler as as a result of new discoveries in emulsion research, Donald McMaster, general manager of Eastman Kodak, recently reported at the convention of the Photographers' Association in New York City.

Color film quality will improve and color film speeds will eventually become as fast as black-and-white, he said. Many new effects and increased realism would then be possible in color motion pictures. At the Convention, McMaster was made an honorary Master of Photography, the highest award the Photographers' Association can bestow.

DuMont's Tv and Film Camera

Sales of the "Electronicam" are expanding. Film studios and Tv stations throughout the country are now finding wide use for this combination television and motion picture camera developed last year by DuMont Laboratories, it is reported by James L. Caddigan, director of marketing. The Electronicam is able to transmit a live television show and, at the same time, make a photographic record of the show, which can be edited for use by other stations.

Cinerama's Own Production

Anticipating the day when the exclusive right to the production and distribution of Cinerama picures will no longer be the exclusive right of Stanley Warner, Cinerama Inc., has organized its own production department with Lewis Grant Leenhouts at the helm. Although SW retains the exclusive rights to produce and distribute Cinerama picures until the end of 1958, it could lose them if it failed to turn out one Cinerama picture yearly until then.

NEW CEMENT APPLICATOR



Ethyloid's new cement contoiner with rubber-topped glass dropper. To use this bottle opplicator, squeeze the rubber top lightly so os to get o smoll amount of cement in gloss dropper, then draw end of dropper over the scroped film edge as you would a brush. Do not squeeze top while drowing dropper across the film for too much cement will spoil the Splice.

JACKSON'S Reel-End Alarms

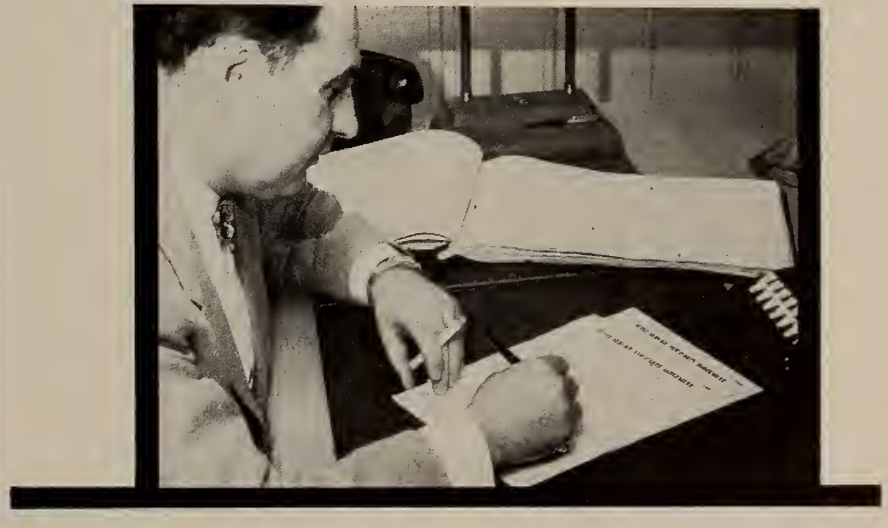
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TRENDS IN SHUTTER DESIGN

(Continued from page 19)

its correct position. The set-screws are then tightened, and a finer adjustment effected by manipulation of the shutter-setting knob. This may be done while a film is being projected if the projectionist removes the pane of glass from the observation port and turns off the projection-room lights. Title footage having white letters on a black background may be used as a travel-ghost test film.

More accurate results are usually obtained when the shutter is checked against the intermittent sprocket. The middle of one of the blades should coincide with the middle of the light-beam when the intermittent sprocket is in the middle of the pulldown. In other words, the shutter blade should be exactly half way through the light-beam when exactly 2 teeth of the intermittent sprocket have passed by some fixed point selected as a reference.

Width of Blades

2. ANGULAR ERRORS. A shutter may be "in time" and yet give poor results because the blades are (a) too narrow, (b) too wide, (c) unequal in width, or (d) asymmetrically placed, making one opening wider than the other.

Travel ghosts will flare out from *both* the tops and undersides of bright objects in the picture when the blades are too narrow. The only cure is to widen the blades so that the film is occulted all the time it is in motion.

It should be kept in mind that the theoretical limit of 50% transmission (shutter blades 90 degrees in angular width) can be realized in practice only with the most efficient shutters, such as the conical and cylindrical types. When single-rotor fan-type rear shutters are used it is necessary to employ blade widths of from 99 to 117 degrees (transmission 45% to only 35%), depending on the width of the light-beam where the shutter cuts it.

Shutter blades wider than necessary do not interfere with the quality of the picture, but if they are excessively wide they may waste too much light. The extra loss of light occasioned by having the blades only *slightly* wider than absolutely necessary is inappreciable. To insure top-quality projection the blades of the shutter *ought* to be *slightly* wider than is necessary to eliminate the travel ghost danger!

There are two very good reasons why shutter blades should not be trimmed to minimum width. First, a certain amount of backlash in the gears that run the shutter is unavoidable in many of the older mechanisms. If the blades were originally just barely wide enough to prevent travel ghost, "hunting" of the shutter (alternations of lag and lead) will result in transient travel ghosts which may flare alternately from the tops and bottoms of bright objects.

Trembling of Screen Image

Second, the acceleration-deceleration characteristics of the standard geneva intermittent movement are such that the film moves very slowly at the very beginning and at the very end of each pulldown. If the film is projected to the screen while beginning or ending its movement, either because the shutter hunts or the blades are too narrow for complete occulation, a peculiar vibration, or trembling, of the top and bottom edges of all sharply defined highlights is produced.

This type of image-trembling cannot be seen from the projection room, as a rule, but it is readily perceived by observers positioned nearer the screen. It is often described as a "flickering" of the top and bottom edges of *clearly focused* white areas, and is especially noticeable when titles are shown. The vibration disappears whenever the picture is thrown very slightly out of focus.

A non-animated title on motion-picture film should be as sharp, rock-steady, and free from vibration as a

National Theatre Supply Adds New Rectifier

A new low-priced rectifier designed for use with angle or coaxial trim high-intensity projection lamps has just been anounced by National Theatre Supply.

Known as the "Excelenium," this new 3-phase selenium-type rectifier is rated at 90 to 135 amperes. Features include convenient output control, a heavy-duty ventilating fan, and moisture-proofed plates which assure dependable operation in damp climates.

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well-projected lantern slide, no matter how bright the picture may be. Even when all other factors are satisfactory, the presence of edge-vibration, even if too slight to be seen for what it is, imparts to the picture a vaguely sensed "flickery" quality that most observers associate with the conception of a rapidly moving film.

Avoid Excessive Trimming

Because motion-picture projection of the highest quality involves perfect freedom from all flicker, vibration, and travel ghost, complete frame-shift occultation is advocated even at the expense of a few per cent of the available screen illumination. Projectionists, therefore, should avoid trimming their shutters excessively, especially when screen illumination is high. Nothing is gained by shutter-blade trimming except loss of picture quality, for the amount of brightness gained is too small to be perceived.

An example may be given. Suppose that flawless projection is obtained with shutter blades 104° in angular width (transmission 42.3%). The blades are then narrowed down to 101° (transmission 44.0%) in order to gain more light. But actual increase in screen illumination is only 3.9%—not enough to make the picture look brighter. In fact, a light-gain of 5 or 6 per cent is required for a *perceptible* increase in brightness. Nothing has been gained except possible travel ghost or edge-vibration, and the high projection quality formerly enjoyed has been lost.

It is preferable to *lose* 3.9%—or even 6%—of the light by widening the shutter blades to insure steady, flickerless projection even at the highest light levels. Only in drive-in theatres, where light is at a premium, can the projectionist afford to risk the introduction of flicker and travel ghost by trimming the shutter blades beyond safe-and-sane limits. If light is poor and the focus is bad, projection defects cannot be so readily seen.

Unbalanced blades constitute another form of angular error in shutters. If the two blades are of unequal width, or if they are alike but displaced to give openings of unequal angular width, 24-cycle flicker will be added to the normal cutoff frequency of 48 cps. Many of the projector shutters in daily use have been carelessly trimmed at one time or another, creating a condition of imbalance sufficiently great to produce 24-cycle flicker. The angular widths of *both* the openings and the blades should be checked with an accurate protractor.

3. Phasing Errors. It is not likely that the shutter of any commercial projector will be geared to the mechanism *in a wrong gear ratio.* Incorrect phasing is thus never encountered by the average projectionist. It will turn up only in home-made TV projectors in which the regular shutter shaft is wrongly utilized. There are 2 exposures of each frame in optical projection, but in Tv projection there are 5 exposures for every 2 frames—the 2-3-2 sequence of exposures.

4. Rotational Errors. It has been found by experiment that, whenever a symmetrical shutter is rotated rapidly enough to render flicker imperceptible, any sudden change in the speed of the shutter generates an easily seen pulse, or flash, of flicker. The shutter of a motion-picture projector, therefore, must revolve at a constant speed.

In many projectors, especially the older models, the shutter works through a complex system of gears which automatically advances or retards its rotation whenever the picture is framed up or down on the screen, the correct shutter-and-intermittent relationship being maintained at all times.

Backlash of Old Gears

While the complicated shutter gearing may function properly in a new machine, more or less backlash may develop when the gears and bearings become worn. The revolving shutter then "hunts," lagging and leading within a small range of speed variation. If the hunting is smooth and gradual, no flicker will appear, but

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it happens that sudden, although small, speed changes are usually involved. Each change of speed produces a perceptible pulse of flicker which is frequently mistaken for sputtering of the carbon arc.

It is very desirable to minimize hunting of the shutter by replacing all gears and bearings responsible for excessive backlash. In certain older machines, the framing slide and associated lever and spring should be checked for tightness, and end-play removed. Looseness of the spiral drive gear on its flat-faced drive shaft is especially troublesome.

[CONCLUSION]

SMPTE DRIVE-IN SURVEY

(Continued from page 14)

factors are completely different.

The Screen Brightness Committee and the Society of Motion Picture and Television Engineers have had outstanding cooperation from a great many people in the conduct of this survey. Theatre projectionists and their organization, the IATSE, and the theatre managers have been most cooperative in permitting this survey and in assisting Committee members

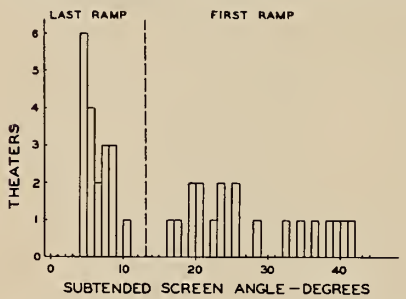


FIG. 10. Maximum and minimum subtended screen angles. Maximum angles for the theatres surveyed were measured from the center of the front ramp, minimum angles from the center of the back ramp.

in obtaining the data. It has been most heartening to observe that all those directly associated with the presentation of drive-in motion pictures have been extremely anxious to help improve the quality of this form of entertainment.

The Committee is particularly appreciative also of the assistance of C. E. Heppberger and others of the National Carbon Co. and of the assistance of many members of the Eastman Kodak Co. in carrying out the survey in different areas of the U.S. and in analyzing the information.

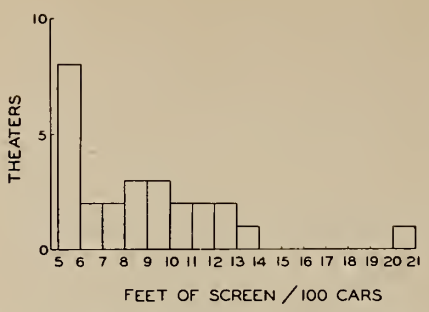


FIG. 11. The relationship of screen width to theatre size is shown. Figures at bottom show the number of feet of screen width for each 100 cars of capacity. It is an indication of past ideas on the size screen appropriate to theatre size.

THE TODD-AO SYSTEM

(Continued from page 10)

which is already objectionable on a conventional movie screen, becomes intolerable on a large flat screen. Scientists at the American Optical Co. conducted a series of careful experiments to see what squeeze could be tolerated without objection when looking at the screen from an angle. They then studied theatres to see how many seats present an objectionably squeezed picture and which seats give a good picture. In the average theatre twice as many orchestra seats are satisfactory with the Todd-AO curved screen than with a flat screen of equivalent width."

Against Deep Curvature

Questioned on this point, one independent projection expert replied:

"Despite what the AO people say, best viewing of Todd-AO, Cinerama, and all other pictures projected upon deeply curved screens is limited to the middle of the auditorium. Viewed from the side, foreshortening effects vary from one side of the screen to the other, actors on the side nearest the observer looking very thin. There is no way out of this dilemma; and I might say that varying degrees of foreshortening in a picture are more objectionable than a uniform degree, as when a flat-screen image is viewed from the side of the auditorium."

This article is not meant to give a critical view of the finished Todd-AO process. Its purpose is to make available to projectionists such information about the system as is now available, and to point out the very difficult problems solved by the engineers who participated in its design.

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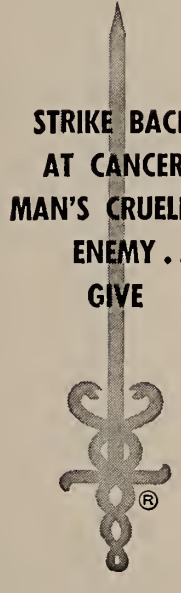
Will one of these unfortunate victims be a friend of yours? It could happen. We know that cancer strikes one in four.

There's a way to help that friend, and thousands of others. That's by helping the American Cancer Society spread its educational message as widely as possible.

Money you contribute improves services to patients, arms everyone with protective information about cancer, and pays for research to conquer this cruelest of diseases.

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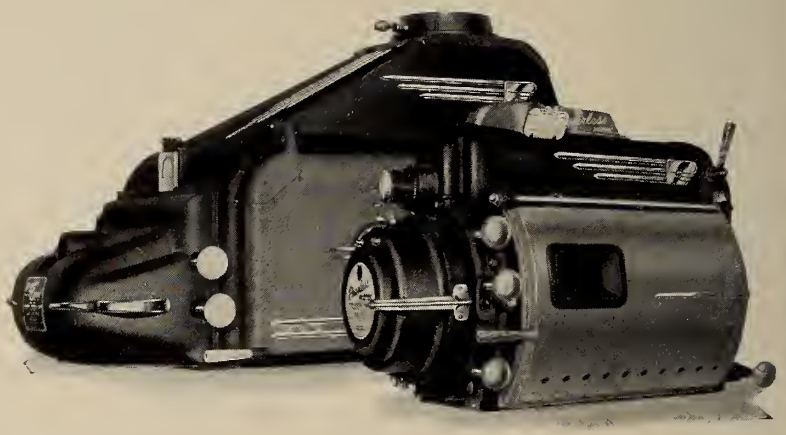
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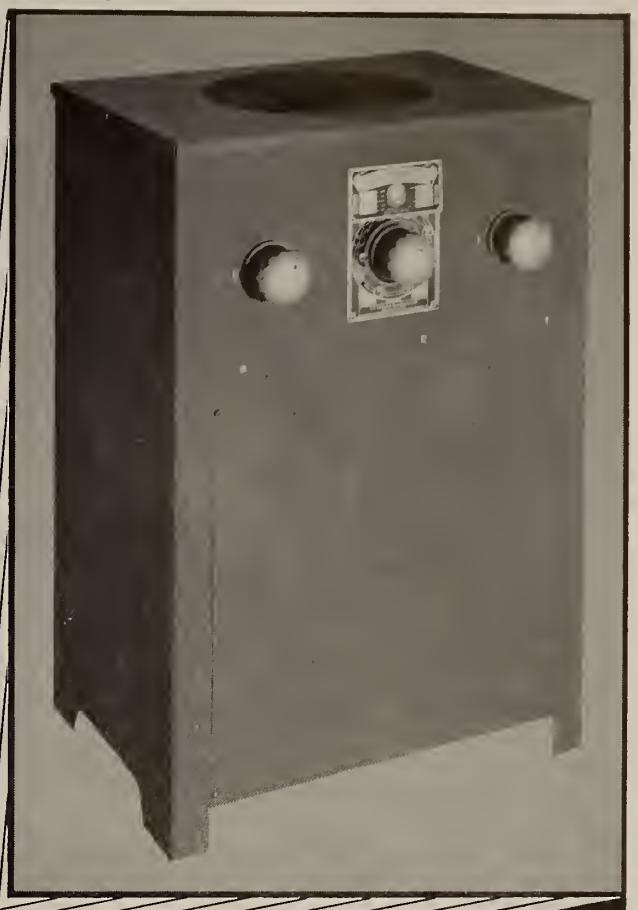
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Monthly Chat

"Good Equipment Seal" for Theatres

MOST PROJECTIONISTS are aware of that pronounced exhibitor tendency to stubbornly avoid replacing antiquated projection equipment before it falls apart. Because of the less-exacting projection requirements for the small pictures used in theatres a few years ago, exhibitors often got away with this short-sighted outlook even though the projectionist cursed while he held his rickety equipment together with baling wire. Since then, things have changed radically. The big screen absolutely requires modern projection equipment.

That's why we think that a plan recently worked out by a motion picture trade organization in West Germany has real merit and might be an effective tool in prodding some tight-fisted American theatre owners into improving their houses by replacing worn-out equipment. The German idea is to provide exhibitors with a free, unbiased, no-obligation survey of a theatre's projection equipment by independent experts. Theatres with equipment "technically unobjectionable" for the job of filling the theatre's screen with a pleasing picture would be awarded a "good equipment seal."

American projectionists, we think, would heartily approve of such a plan and assist it in every possible way. The results, we feel, would give the lie to the frequent accusations that the poor pictures in many theatres are due to careless projeotion.

To be successful here, this plan would probably have to be carried out under the direction of a committee composed of leaders in motion picture technical groups and exhibitor trade organizations. Such groups as the SMPTE and the MPRC might get together with exhibitor organizations. If assured that they would not have to cope with accusations of overselling equipment, manufacturers and their organizations would probably be happy to participate.

SMPTE Courses Point the Way

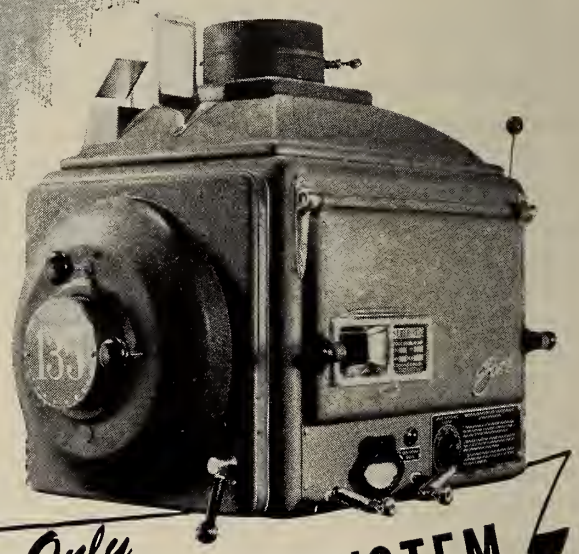
VERY WELCOME is the recent announcement by the SMPTE that it is sponsoring a course in motion picture technology in cooperation with the University of California and interested labor unions, evidently meaning the IA. At present, these courses can be taken only on the West Coast,and they are concerned with studio and laboratory practice rather than with the theatre, but they are still important news to projectionists because this educational program indicates that leaders in the industry now realize that the future of theatrical motion pictures depends on high technical standards.

A logical addition to these courses in film production technology would be a course for projectionists, perhaps held in a number of areas throughout the country, on the best methods of handling the complicated projection problems resulting from the new processes. Operating projection and sound equipment is no simple matter today in most theatres, and there is reason to believe that the situation may remain confusing as time passes. In addition, the introduction of wide-gauge film and elaborate "roadshow" methods of presentation make such a course doubly desirable.

The Projection Arc Lamps You Buy Should Have Automatic Crater Positioning!

Constant enlargement in screen sizes has necessitated a progressive ascent in the amount of light necessary to pleasing projection. To help in attaining this added brilliance a corresponding succession of increases in the burning rate of the positive carbon has been necessary. As compared to a burning rate of about 4 inches an hour in the old low intensity lamps, arcs today burn from 18 to 30 or more inches of positive an hour.

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VOLUME XXX NOVEMBER 1955 NUMBER 11

Rectifiers for Projection Arcs

By ROBERT A. MITCHELL

There is a wide choice of equipment for converting AC to DC current as is required for projection arclamps. Here is a compact but thorough description of the many types of rectifiers available plus tips on maintenance.

ANY ELECTRICAL DEVICE which conducts current *in only one direction* is called a "rectifier." If we apply alternating current (AC) to the input terminals of a rectifier, direct current (DC) will appear across the output terminals. Because this happens, we speak of a rectifier as a device which changes AC into DC.

Rectifiers have many useful applications. Certain types are used in electroplating and battery charging. Smaller rectifiers are incorporated into radios, phonographs, and other apparatus employing amplifiers operated on alternating current. As we might expect, the amplifiers of theatre sound systems involve rectifiers.

Rectifiers are used in many theatres as a source of DC for sound-head exciting lamps. The largest and most powerful rectifiers to be found in a motion-picture theatre, however, are those that supply direct current to the projector and spotlight arclamps. Many theatres, it should be stated, make use of motor-driven dynamos for arclamp service. Good as many rectifiers are, motor-generator sets are usually considered superior as regards constancy of performance and smoothness of the DC output. However, they are more expensive.

Now, motor-generators are current-converting devices which are *not* rectifiers. A motor-generator set, as its name implies, consists of a DC generator (dynamo) driven by an AC motor. AC is consumed by the motor: DC is *created*, or generated, by the dynamo. A rectifier merely rectifies, or "straightens out," the AC power which is fed into it.

A complete arclamp rectifier contains, among other components, one or more transformers, power-regulating controls, and voltmeters. Some types of rectifier also have motor-driven fans to maintain a low operating temperature. But the heart and soul of any rectifier is the part which changes AC into DC by allowing the current to flow in only one direction, blocking its flow in the other direction. The component which performs the actual job of rectifying may be an electron tube (valve) or a junction (couple) consisting of chemically treated metal disks pressed together in firm electrical contact.

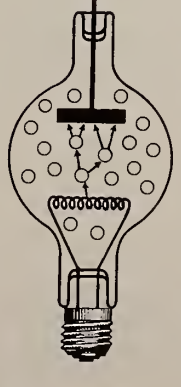


FIGURE 1
In addition to the electrons emitted by the heated filament, a tungar rectifier tube contains atoms of argon gas. These, when bombarded by electrons, give out additional electrons which increase the flow of current. A single electron emitted from the filament results in several electrons hitting the plate.

Even though there are other types, the *tube-type* and *junction-type* ("stack") rectifiers are favored for the purpose of supplying DC current to projection arcs. And in each of these two groups we find several varieties.

Tube-type rectifiers work on the principle that current normally flows through an electron tube in just one direction, namely, from the heated *cathode* (negative element) to the relatively cool *anode* (positive element). The process is very simple, and so is the tube which performs it.

The *tungar* (argon gas-filled) type of rectifying (Fig. 1) tube contains

only these two "elements," cathode and anode. For this reason it is called a *diode*, the prefix *di-* meaning "two," and the suffix *-ode* referring to a tube-element.

Function of Cathode

The function of the cathode is that of an electron-emitter; and in order to emit vast numbers of electrons, the cathode must be heated to a fairly high temperature. The required heat is furnished by a filament very similar to that of an ordinary light bulb. In fact, the filament of the tungar rectifying tube also serves as the cathode.

What happens when the filment of a tungar bulb is heated by turning the current on? The tube sends out light just as an incandescent lamp does. But even though invisible to the eye, multimillions of electrons boil out from a filament and form a cloud of negatively charged particles around it.

The same thing happens when an ordinary light bulb is switched on; but a tungar rectifying bulb also contains a small amount of argon, a rare gas, which assists the rectifying action and glows with a blueviolet light when "ionized" by electron bombardment. The blueviolet glow surrounding the filament reveals the location of the cloud of electrons and indicates that the tube is ready to rectify — which is what we want it to do.

Our diode, with filament lighted, is now in an operative condition. It is only necessary to connect the two elements of the tube in series with an alternating-current circuit — one wire to the cathode (filament) and the other wire to the anode (plate).

Fig. 2 shows the connections and the various components of the simple circuit *which is indicated by the heavy lines.* (Ignore the subsidiary filament circuit drawn with lighter lines.) The heavy-line portion of the transformer secondary represents a suitable source of AC; the resistor marked "load" represents a DC device such as an arclamp; and the white disk represents the diode rectifying tube with filament and plate.

Alternating Current Cycle

The terminals of a source of alternating current swing from positive to negative and back many times each second — 60 times a second in the case of commercial power in the United States. Now, when the terminal connected to the cathode is positive in polarity, the electrons hover close to the filament in a tight cloud because they are repelled by the negatively charged plate. As shown in Fig. 2, no electrons can then pass through the tube; and, as a result, no current flows in the circuit. It is just as though the tube were then an open switch.

A small fraction of a second later the polarity changes, and the terminal connected to the cathode (filament) becomes negative. As shown in "B" of Fig. 2, electrons at once stream from the cathode to the anode (plate), which, being then positively charged, attracts them strongly. The stream of electrons constitutes a flow of current; and the tube then functions as a closed switch.

This action is repeated over and over (60 times a second in the U.S.A., 50 times a second in Europe), the current aways flowing *in one direction.* But note that the positive and negative polarity signs *in Fig. 2 only* signify the polarities of cathode and anode *in relation to each other.* Considered as external terminals of a DC source these symbols must be reversed, *as we have done in all subsequent diagrams.* Confusion can be avoided by remembering that current always flows from negative to positive.

The simple rectifier circuit shown in Fig. 2 employs one diode which passes only *half of each complete cycle* of the AC applied to it, the circuit

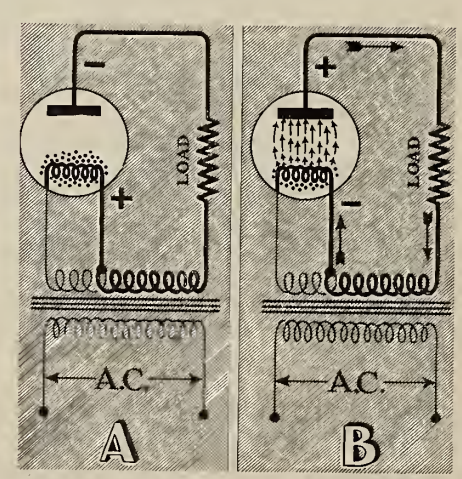


FIG. 2 (A). Electrons cannot pass from the heated filament (cathode) of a rectifier bulb when alternations of the current place a positive charge on the filament and a negative charge on the plate (anode). The electrons, being repelled by the plate, merely cluster about the filament as a space charge. (B). But when the current reverses, the electrons stream across the gap to the plate which, then positively charged, attracts them.

being "dead" during the alternate half cycles when the flow of current is blocked. So it goes without saying that if perfectly smooth, continuously flowing DC is desired, our "half-wave rectifier" is useless. Electroplating and battery-charging are applications which tolerate a strong "ripple" in the current, but projection arcs and sound amplifiers need DC which is free from ripple.

Electrical Filter Units

It happens, however, that the DC output of half-wave rectifiers pulsates too strongly to be smoothed out by any except large and very expensive electrical filter units. To improve the action of our rectifier, therefore, we must add another diode to permit the "dead" halves of the alternations to be rectified and added to the DC output.

The portion of Fig. 3 labelled "A" is a simplified diagram of the same half-wave tube rectifier shown in Fig. 2. For the sake of clarity the subsidiary filament-heating circuit has been omitted. Note the very strong ripple in the graph indicating the DC output of this rectifier.

"B" of Fig. 3 is the same rectifier, but with another diode added to give full-wave rectification. The transformer winding is tapped at its electrical center to provide a positive output terminal. One diode rectifies (passes current) during one half cycle, the other diode rectifies during the succeeding half cycle, and so on, the outputs of both tubes going to the negative output terminal. As the accompanying graph shows, ripple, although still present, has been reduced.

"C" of Fig. 3 shows a full-wave rectifier circuit employing 4 diodes. This hookup, called a bridge circuit, is capable of delivering more power than the 2-tube circuit in "B," although ripple content in the output is the same. This circuit is commonly used in small projection-lamp rectifiers operated on single-phase AC.

The comparatively small amount of ripple in the DC delivered by the full-wave circuits in "B" and "C" can be removed by filter circuits, such as the one shown in Fig. 4. A filter is very often thought of as a device which passes DC while blocking AC, but it actually does much more than that. The *inductance* of the choke coil in series with the circuit, and the *capaci-*

tance of the condenser connected in shunt, work together to chop off the crests of the waves and to fill in the troughs, changing the pulsating DC to smooth, continuous DC suitable for powering apparatus designed to operate on batteries or a dynamo.

The "single-section" filter circuit shown in Fig. 4 must have a very large choke coil and condenser to smooth out the ripple in the output of even a full-wave rectifier operated on single-phase 60-cycle AC. To obtain similar results more economically, several filter sections may be connected together.

Choke-Coil Filter

Very few arc-lamp rectifiers have more than a choke coil for filtering the DC because large condensers are costly and sensitive to high-voltage surges. The output current from a single-phase arc rectifier, accordingly, has some ripple. Light from the arc-lamp fluctuates slightly in step with the ripple of the DC at a rate of 120 times per second when the rectifier is supplied by 60-cycle alternating current.

Even though the flicker is too rapid to be perceived by the eye, the rotating shutter of the projecter interacts with the fluctuations of light to produce beat frequencies which can result in visible flicker. In the case of the 48-cycle shutter cutoff frequency employed in standard soundfilm projection, the beat frequencies are 72, 24, and 12 cycles when 60-cycle current is used, the 12-cycle beat usually being the strongest. When 50-cycle current is used, as in most European countries, the beat frequencies are 52, 4, and 2 cycles, the last ordinarily being the strongest. It is interesting to realize that the 2-cycle beat from 50-cycle rectified current is sufficiently slow to be much less conspicuous than the 12-cycle beat from 60-cycle rectified current.

Most projection-arc rectifiers, however, are supplied by 3-phase, rather than single-phase, 60-cycle AC. Now, 3-phase AC is equivalent to three separate, but interdependent, sources of AC; and a rectifier designed to operate on 3-phase current must have at least 6 diode bulbs for full-wave rectification, as shown in Fig. 5.

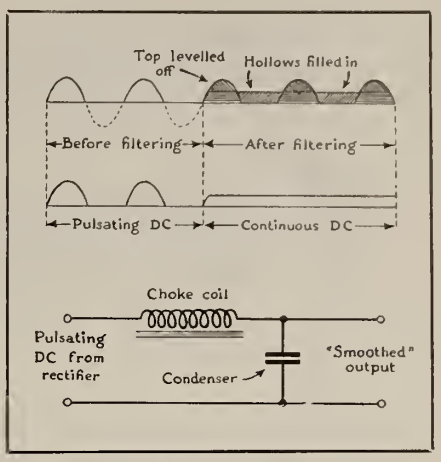


FIG. 4. "Single-section" filter circuit having a choke coil (inductance) and a condenser (capacitance) to "smooth" the pulsating DC output of a rectifier into continuous (non-pulsating) DC.

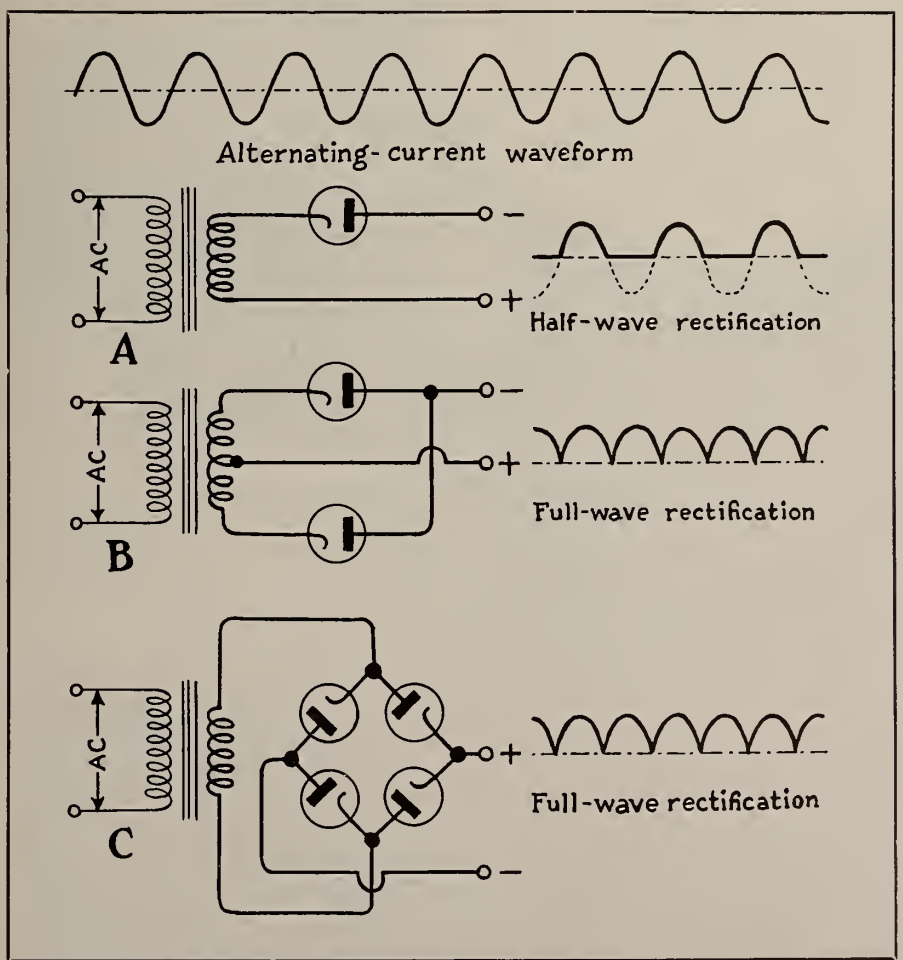


FIG. 3. Single-phase rectifier circuits with subsidiary filament circuits omitted for simplicity. (A). Half-wave rectifier. (B). Full-wave rectifier. (C). Bridge-circuit full-wave rectifier. Note relative amounts of "ripple" in the pulsating DC outputs of these circuits.

Three-Phase Advantage

The advantage of 3-phase current for arc rectifiers lies in the equal angular displacement of the separate phases: the rectified current has only a slight ripple, and the pulsations are so rapid (360 per second in the case of a full-wave rectifier supplied by 60-cycle 3-phase AC) that no filter circuits are needed. Beat frequencies in the projected light do not appear unless differences in the outputs of the 6 tubes exist—which, unfortunately, is sometimes the case.

Mercury-vapor rectifiers are similar to tungar rectifiers in principle, the chief difference being the substitution of mercury for argon gas in the bulbs to increase conductivity of the current (electrons), making it possible to rectify greater amperages with fewer bulb units.

From the operational point of view, mercury-vapor rectifiers must be turned on at least 3 minutes before the projector arcs are struck in order to insure complete vaporization of the mercury and to avoid flashover in the tubes. Tungar bulbs, on the contrary, are ready for use the moment the filaments light up—a matter of a couple of seconds.

Mercury-vapor diodes are often erratic in current delivery and are more sensitive to changes in line voltage than any other commonly used rectifying device. Tube life is also rather uncertain, some mercury tubes lasting

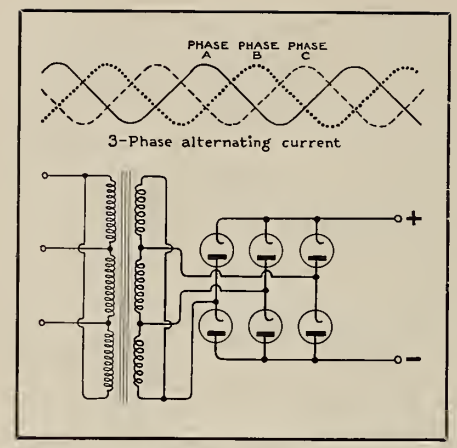


FIG. 5. Three-phase rectifier circuit with "delta" transformer-winding connections. The diode tubes shown in the diagram (tungar or mercury-vapor) may be replaced by junction units, as in a stack-type rectifier.

for months or years, and others suddenly failing to deliver full current. These rectifiers are sometimes noisy.

The circuitry involved in junction-type rectifiers (commonly called "stack" and "dry-disk" rectifiers) is basically the same as that previously given for tube-type rectifiers. There are no filament circuits, of course. In place of diode tubes, these rectifiers have stacks of specially treated metal disks. The several varieties are named after the material used on the surfaces of the disks for unidirectional current flow — copper oxide, copper sulfide, and selenium.

Danger from Heat

Junction-type rectifiers are efficient and very compact. They give out no light, but do generate considerable heat. Because the heat generated in the rectifying stacks can be very detrimental, fans are provided. To protect a rectifier of this type against injury in the event of fan failure, the main "on-off" switch is often a relay operated by a vaned switch actuated by the draft created by the fan. The projectionist, therefore, turns the rectifier on and off by means of the small fan switch.

The tungar-tube type of rectifier is preferred by many projectionists. It is quieter and less unpredictable in operation than the mercury-vapor type, and it is less expensive than the junction type. Copper oxide and sulfide junction-type rectifiers are long-lived under the most favorable conditions, but are quickly injured by temperatures in excess of the maximum rated operating temperature. In addition, selenium units are sensitive to the presence in the atmosphere of acid fumes, oxidizing agents, or metallic vapors.

Rectifiers for projection arcs are considerably lower in cost than motor-generator sets of the best quality, but often more expensive to maintain. With the exception of some of the older mercury-vapor rectifiers, they are quieter in operation than generators.

Rectifiers More Efficient

Rectifiers are electrically more efficient than motor-generator sets, wasting less current. Part of the reason for this may be found in the fact that multiple-arc generators require the use of current-consuming ballast rheostats, while the "falling-volt" characteristics of rectifiers eliminate the need for rheostats. But whereas one multiple-arc generator is sufficient to power several projection lamps, permitting two lamps to be burned at the same time during changeovers, there must be one separate rectifier for each lamp. (Trick switching arrangements intended to make possible the operation of two arcs from one rectifier are not approved.)

The performance of motor-generator sets is very reliable mechanically, and they are not affected by minor line-voltage variations. The output of a generator is also somewhat smoother than that of an ordinary arc rectifier, the slight commutator ripple being smaller than the ripple present in the output of even 3-phase and 6-phase rectifiers. In addition the output of a generator is also less adversely affected by temporary overloads.

Flicker on Screen

A disadvantage of rectifiers for projection service is the possible *inconstancy* of the DC output and consequent flicker of the projected light. Because a rectifier "straightens out"

(Continued on page 32)

Proposed Magnetic-Optical CinemaScope Print

The Motion Picture Research Council, along with four major Hollywood studios, has proposed a combination of magnetic-and-optical sound tracks on each CinemaScope print to replace the separate magnetic and optical prints now made for all CinemaScope releases. The proposed dual-purpose print, with a single optical sound track running alongside the number 2 magnetic track, recently underwent a series of tests in New York City.

Earl Sponable, technical director of 20th Century-Fox where CinemaScope originated, has come out against this idea, stating that theatres now equipped for full stereophonic sound would be forced to cut the 2.55 CinemaScope aspect ratio to 2.35 or less, and that other theatres would be getting only "half a track" instead of a full optical sound track.

He advised all theatres to install magnetic heads, and to reproduce only the number 2 track of the CinemaScope magnetic print if single-channel sound was desired. The number 2 or center-horn track of the magnetic print will reproduce all sound recorded for a picture. To play this track, only a relatively small investment in equipment would be required. Needed would be a penthouse reproducer, magnetic preamplifier and CinemaScope sprockets.

The purpose of the proposed new magnetic-optical print is to avail distributors and exhibitors of a wider selection of marketable films. Distributors for a long time have objected to the high costs of magnetic prints and the limited market for them. Theatres on the other hand have complained that only a limited supply of magnetic or optical prints are available to them, depending on which type of installation



The proposed combination magnetic-optical print would look like this. Note that the print contains the four magnetic sound tracks of CinemaScope stereophonic sound, with an additional optical track running alongside the No. 2 magnetic track.

they use. The dual-purpose single print is intended to increase the number of prints available for theatres using either the magnetic or optical systems.

"Mixer" kits offer an alternative solution to theatres not able to install full stereophonic sound. Now used in many drive-ins and being considered by indoor theatre owners as well, the mixer system channels all four CinemaScope magnetic tracks into one magnetic preamplifier. Provision can usually be made for conversion to a complete stereophonic system at a later date.

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55-mm CinemaScope Negative Will Improve Definition

Soon most 35-mm CinemaScope prints will be made from 55-mm negatives. Fox will also provide 55-mm prints for use by de-luxe houses. This article is reprinted through courtesy of the *International Cinematographer*.

By ARTHUR GAVIN

WHEN 20th Century-Fox took the $60,000,000 gamble on CinemaScope two years ago, it was with the promise to the industry that the studio would spare no expense in further improving the photography and exhibition of super-wide-screen CinemaScope motion pictures.

In recent weeks, another significant step has been taken by the studio, destined to further enhance the quality of CinemaScope productions. This was the development of the Fox 4X-55-mm camera. The "4X" symbolizes the four-times greater information-recording area of the 55-mm wide negative which is used in the camera.

The first Fox CinemaScope production, "The Robe," was started when the studio possessed but a single French-made anamorphic lens. This lens was subsequently improved by studio engineers and was known as an anamorphic "attachment" lens, because it was used in conjunction with the regular camera lens—mounted in front of it in the same manner that objective lens and anamorphic adapter are combined in the projection room.

Last year, Bausch & Lomb developed for the studio a combination CinemaScope lens in which the anamorphic and the objective lenses are combined in a single unit. This significant step greatly improved definition and depth of field and reduced distortion to a minimum.

New Anamorphic System

The 4X-55-mm camera was designed by 20th Century-Fox engineers and utilizes an entirely new type of anamorphic lens designed by the studio's New York research department and Bausch & Lomb engineers working in concert. With the new lens and the wider 55-mm negative, the studio claims it is possible now to achieve greatly improved wide-screen photography—much clearer and better defined pictures and a great deal less distortion on the screen.

Specifically, what is achieved by the new camera and 55-mm film is (1) a wider negative for use in making 55-mm release prints for roadshow type of theatre presentation, and (2) by optical reduction of the 55-mm negative, a much higher quality 35-mm CinemaScope print. Thus it would seem that the studio has taken a major step in fulfilling the promise it made with the advent of its venture into CinemaScope.

Special Lab Equipment

According to Sol Halprin, Fox executive director of photography, everything about the new 4X-55-mm system is new—camera, lenses, film, new printers, new travelling matte printers, and new developing equipment.

In the beginning, blank Eastman Color negative stock was slit in 55-mm widths, then perforated as required by a machine which the studio constructed especially for the purpose. Today of course, the negative stock properly perforated, is being supplied by Eastman Kodak.

The first 4X-55-mm camera was rebuilt on the lot by Fox engineers. Heading up the project were Sol Halprin, Earl Sponable, and Grover Laube. The present camera is equipped with 1,000-foot film magazines. Subsequent cameras, Halprin says, will have 2000-foot magazines and many innovations such as an improved pull-down mechanism, the ultimate in registration, and extreme fine contact at the aperture. The new cameras will be built for 20th Century-Fox by a prominent motion picture equipment manufacturer.

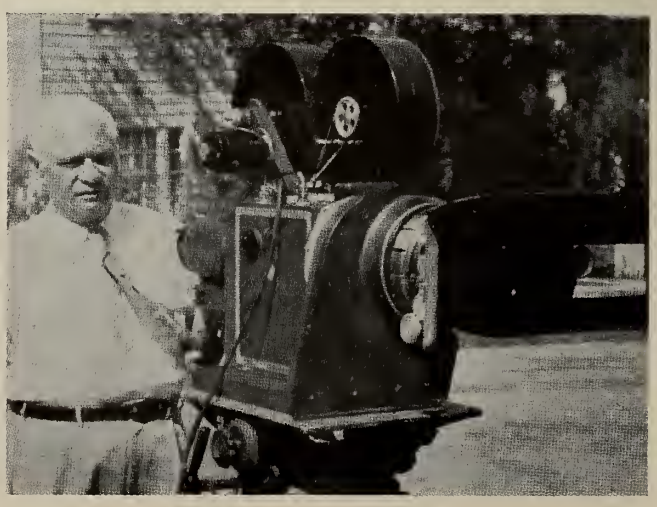
Shooting of "Carousel"

Following exhaustive tests at the studio, the prototype 4X-55-mm camera was assigned to Director of Photography Charles G. Clarke, A.S.C., for shooting the studio's initial 55-mm production, "Carousel." Shooting began on location in Maine, and the camera is exceeding all expections.

As one might expect the studio to properly do in putting a hitherto untried camera into production for the first time, the 4X-55-mm camera was backed up by a second standard 35-mm camera, also shooting in CinemaScope, as a protective measure.

It was not until after three weeks location shooting on "Carousel" at Boothbay Harbor, Maine, that studio executives saw any of the 55-mm camera results on the screen at the

(Continued on page 31)



Sol Halprin, Fox Camera Chief, examines the new 55-mm camera which will soon be used to shoot all CinemaScope films. Use of a 55-mm negative will make it possible to produce a sharper 35-mm 'Scope print for all theatres. No new equipment will be required for projection.

Present heavy demands on projection equipment point to the need for re-examining the heart of the mechanism —— the intermittent. The many advantages of a faster 5-to-1 movement over the 3-to-1 geneva movement should receive serious thought from designers.

By JOSE M. RUIZ

Fast-Pulldown Intermittent Movements Solve Many Projection Problems

IN REGARD to Mr. J. G. Jackson's letter appearing on page 23 of the September issue of IP, I wish to state that it was not my intention to deny either the originality or the workability of Mr. Jackson's intermittent mechanisms. I still incline to the view, however, that Jackson's oscillating-cam intermittent is too complex. The reason is simple: the ideal mechanism for film transport is one which has the fewest possible parts in motion. The motion-picture projector, and particularly the complete film-transport mechanism, should be simple as well as dependable.

The claw intermittent mechanism has been used for many years to produce intermittent travel of the film in most 8-, 9.5-, and 16-mm. "substandard" projectors. As a matter of fact, claw movements were even used in professional 35-mm. motion-picture projectors in the early days of cinematography. From the days of the Lumiere Cinematographe, the first practical camera-projector, to the present time, the claw intermittent of the classical 3-corner cam-and-shuttle type has been the intermittent device most widely used in amateur and professional substandard cameras and projectors. They are easy to manufacture and are very accurate in pulldown action.

16-mm Geneva Movements

The idea of employing the geneva intermittent mechanism and its variants for substandard projectors is very old, and was always in the minds of many professional and amateur designers. As early as 1916, for example, Thomas Armat employed an interesting variant of the geneva movement for amateur cinematography, his experimental machine being the first substandard projector using an intermittent *sprocket* instead of the usual shuttle, or claw. Of course, the Armat intermittent mechanism handled 17.5-mm. film with the familiar 4 perforations per frame, and hence the 16-tooth sprocket was directly mounted on the 4-position square intermittent star of special design.

The Geneva drive and its variants are used at present in many American and European projectors manufactured with excellent design and operational features. Now, the use of geneva mechanisms for 16-mm. projectors is feasible if the designer bear in mind a few of the fundamental laws of the geometry of geneva drives and the physical limitations of 16-mm film.

The principal handicap of the 4-point star for 16-mm. intermittents is the small diameter and small num-

Why This Article Is Noteworthy

IP HAS LONG advocated intermittents *faster* than the conventional 3-to-1 (90-degree) geneva movement. The advantages of 5-to-1 (60-degree) movements have been pointed out time and again in these pages. Rapid intermittents allow narrower shutter blades for brighter pictures, when maximum screen illumination is desired, or alternative 3-blade shutters for virtually flickerless projection at the highest light levels. We have even presented detailed descriptions of fast-acting intermittents on several occasions, a noteworthy recent example being the oscillating-cam movement designed by J. G. Jackson (IP for February 1955, page 7).

New equipment has literally poured into the theatres since 1950. First 3-D, then CinemaScope and stereophonic sound, now horizontal VistaVision, Todd-AO, and who-knows-what. Changes have been many, and improvements have taken place in many departments of production and projection. *But the sluggish intermittent movement of the theatre projector remains untouched!*

Equipment designers have all but neglected the "heart and soul" of the projector. Why? Frankly, we don't know why! And yet the urgent need for a faster intermittent of suitable acceleration-deceleration characteristics can be met — and soon! To support our seemingly bold contention, we herewith present an enlightening exposition of rapid variants of the familiar geneva movement by a remarkably well-informed authority on the subject, Jose M. Ruiz of Santa Clara, Cuba.

Projector designers may well take note of our author's high praise of the "eccentric-star" geneva-type intermittent, *a movement which may be used even in any present-day theatre projector!* The acceleration characteristics of the eccentric-star movement are all that could be desired: its more rapid deceleration is of no consequence in theatre machines which, after all, are never run in reverse.

Notes on the adaptation of geneva movements to 16-mm. projection are included in Senor Ruiz's informative article.

ber of teeth on the 4-frame 16-mm. sprocket — in this case a diameter of 3/8 inch and only 4 teeth. The heavy stress imposed upon the film by the wrap around the 4-frame 16-mm. sprocket (shown in Fig. 1) results in an obvious mechanical and physical impracticability when such a sprocket is mounted directly on the starwheel shaft.*

Jackson's Movement

The intermittent of Jackson's design is without doubt an original mechanism. After an intensive review of Mr. Jackson's article, the writer believes that such movements are operable for 35-and 16-mm. work. With the latter size of film it is possible to use either an 8-frame 16-mm. sprocket geared down by means of 2 herringbone Nylon gears of constant velocity ratio in 1-to-2 ratio, or an 8-slot geneva star with the 8-frame sprocket mounted directly on the star shaft by taking advantage of the fast-working action of the double-oscillating cam of Jackson's 60-degree pulldown.

One interesting fact about these oscillating intermittents would be the calculation of the forces involved in the several mechanical components in motion and the operational noise level of the mechanism. Three types of forces are involved: rotational, accelerating, and frictional. Intermittent movements which have more than 2 components in motion are mechanisms of great complexity, and the question of accelerating forces must be considered very carefully by the designer.

The immediate reaction to the unsuitability of 4-frame sprockets for 16-mm. purposes is to ask why a larger sprocket may not be used with the geneva star-and-cam mechanism. Why not, for example, use an 8-frame sprocket in conjunction with an 8-point star? The arrangement shown in Fig. 2B is mechanically feasible, but has the drawback that the "intermittent efficiency," or the equivalent of film-pulldown time in terms of the revolution of the cam pin, is increased to 135 degrees (Fig. 2B) as compared with the 90-degree pulldown of the conventional geneva movement used in 35-mm. projectors, and shown in Fig. 2A.

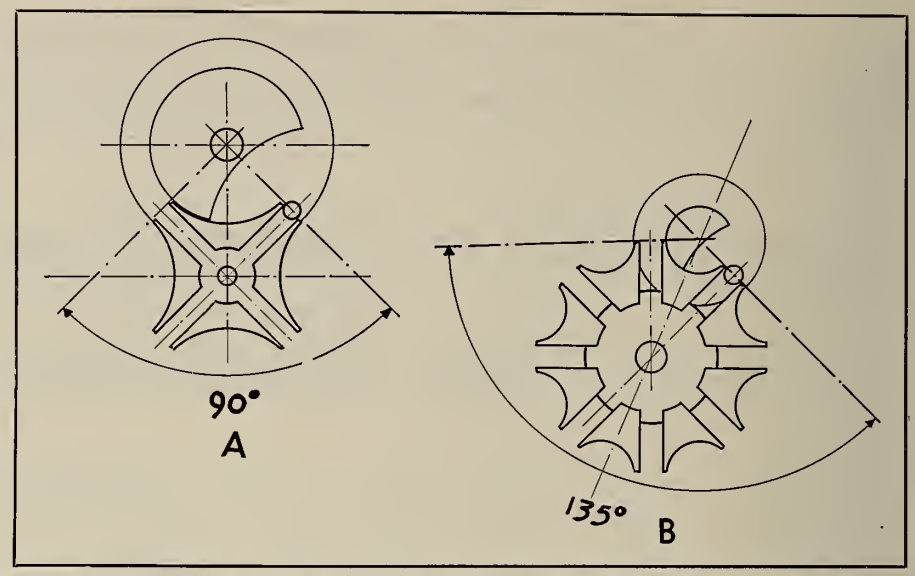


FIG. 2. Comporison is mode between o conventional 35-mm genevo movement A ond o suggested 8-point stor for use with on 8-frome 16-mm sprocket shown ot B. A drawback of orrongement B is thot pulldown time is increased.

A study of Fig. 2B reveals that the 8-point star takes 3/8 of one revolution of the cam pin to move one frame of film in the gate. According to the geometry of the geneva star, an increase in the number of slots, or stations, results in an increase in the pulldown time in degrees. *This is the chief disadvantage of a geneva drive having more than 4 slots in the starwheel.* There are, however, ingenious mechanical expedients which successfully circumvent the geometric limitations of the conventional geneva mechanism.

Geared-Down Movements

A direct solution to the problem has been effected by the German firm of Eugene Bauer in the Selecton II 16-mm. projectors having sprocket intermittents. The Bauer machine employs a 4-point star geared down by means of two high-precision constant-velocity gears to an 8-frame sprocket in 1-to-2 ratio, as shown in Fig. 3. The star rotates through an angle of 90 degrees while the sprocket turns only 45 degrees. This geneva movement gives rocksteady and quiet operation, but the use of a gear train *interposed between the star and the* sprocket is highly objectionable if the gears have not been produced with sufficiently great precision or do not have a scientifically correct tooth shape.

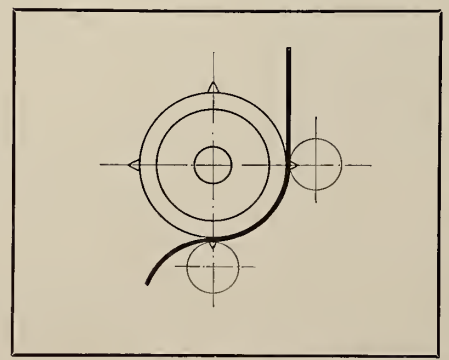


FIG. 1. This drawing shows the 4-frome 16-mm sprocket. The heovy stress imposed on the film when wropped oround this sprocket makes it impracticol.

Accelerated Intermittents

The use of an 8-slot geneva star with one or more "accelerator elements" designed to bring the pulldown cycle under 90 degrees, shown in Fig. 4, illustrates the geometric functioning of the off-center accelerator element upon the cam driver.

The 8-point star *A* is actuated by the cam *B*. The pin *C* is shown at the start of the pulldown. The cam shaft has a large disk *D* with a slot *G* in its back face. Into this slot enters pin *C'*, which is mounted on the off-center shaft *F* by means of the disk *E*. It can thus be seen that the constant rotation of the drive-disk *E* will be converted into accelerated and decelerated rotation of the cam *B, and the geneva star will be actuated in its pulldown at the highest point of acceleration of the disk D.*

The amount of off-center displace-

* EDITOR'S NOTE:—To Correct any misapprehension which might arise from the above discussion of the unsuitability of 4-tooth intermittent sprockets for 16-mm. projectors, we take the opportunity of pointing out that intermittent sprockets of such small diameter were never advocated by J. G. Jackson, inventor of the oscillating-cam movement.

"I consider, as does Mr. Ruiz," writes Mr. Jackson, "that the 4-tooth (16-mm) sprocket is too small to be practical."

ment of disk *E*, from disk *D*, alters the rapidity of the pull-down shift, hence any speed desired, from the fastest pulldown of 30 degrees to one as slow as 135 degrees, is possible.

The principle of geneva drives employing accelerators in conjunction with an 8-slot star is presently utilized in a few European 16-mm. projectors such as the Duiker and Philips in Holland and the Ideal, the Leitz, and the Hortsman in Germany. And in America Eastman Kodak employs the same principle in the Model 25 projector.

The Kodak machine has an 8-point geneva star and 2 balanced accelerators with the off-center arrangement to effect a pulldown of only 57 degrees. The movement gives rocksteady pictures and is free from operational noise. The alternated position of the accelerators reduces bearing loads and vibrational forces inherent in all high-speed mechanisms where sudden accelerations prevail.

The possibility of changing the pulldown time from the high acceleration of 30 degrees to one as slow as 135 degrees makes the "variable-pulldown" intermittent very useful in television work. Eastman Kodak offers the Model 25 projector for full storage operation with iconoscope television cameras in which the pulldown time may be adjusted to accomodate the TV scanning period.

"Drunk-Cam" Intermittents

Mechanisms of the pin-cross type resembling the old Powers intermittent are sometimes used. Still another type of mechanism for pulling the film intermittently through the projector gate is known as "drunk-cam" type. These make use of cylindrical grooved cams and "pinstar" wheels, as shown in Fig. 5.

This type of intermittent and its variants usually have a 60-degree pulldown time. The Miracle 16-mm. projector has a 6-pin star made of hard alloy cast by a special process and ground to glass-finish surfaces. The cylindrical cam is made of a hard aluminum alloy developed during the second World War. Both pin-star and cam are machined to close tolerances.

This by no means exhausts the list of variants of the familiar geneva intermittent movement. The Holmes Tutor projector employs an interesting one. This machine has an 8-slot star actuated by a "V" edge-disk having an interrupted section to unlock the star during the pulldown cycle. The pulldown action is achieved by a steel wire attached to the cam body; and it works as a "face cam." Pulldown time is approximately 60 degrees.

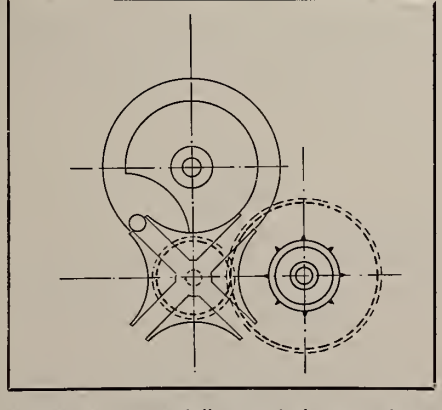


FIG. 3. A commerciolly proctical 16-mm intermittent employing a 4-point stor geored down by means of two high-precision constont-velocity geors to on 8-frome sprocket in 1-to-2 rotio.

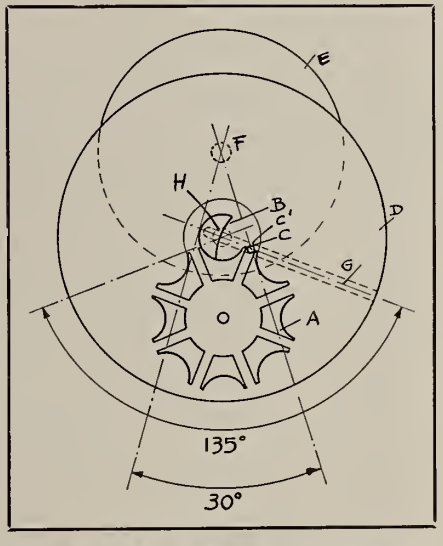


FIG. 4. An 8-slot geneva star with one or more "occelerator elements" designed to bring the pulldown cycle under 90 degrees. Illustroted is the geometric functioning of the off-center occelerotor element upon the cam driver.

Another interesting projector intermittent of the drunk-cam type is found in the Model PB-100 manufactured by the General Precision Laboratory. This projector employs a 12-pin star and drunk cam. Framing is accomplished by rotation of the intermittent sprocket *via* an ingenious arrangement of gears and a spring-loading device in the drunk-cam shaft.

Eccentric-Star Movement

The eccentric-star intermittent provides a 60-degree pulldown with the great advantage of having only two

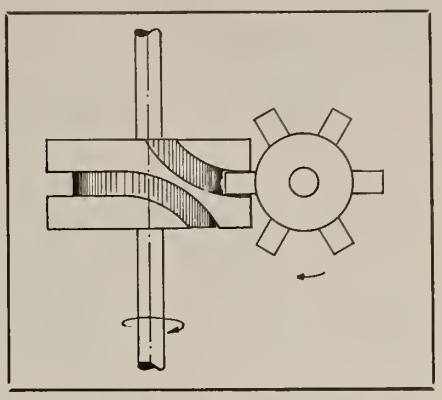


FIG. 5. "Drunk-com" type of intermittent movement which makes use of cylindricol grooved coms ond "pin-stor" wheels.

mechanical parts in motion. The accompanying drawings demonstrate in a graphic way the curves developed by the working angle of cam rotation and film velocity in the gate.

The curve plotted in Fig. 6 shows the velocity generated in the conventional 4-point, *radial-slot* geneva star. The velocity of the film as the pin enters the slot tangentially is practically zero up to about 8 degrees of cam revolution, and with rapidly increasing acceleration it reaches the maximum pulldown velocity at the top of the curve (half pulldown cycle), or 45 degrees of cam rotation. At this point the velocity of the star is greater than that of the cam. The other half-curve component is the reverse of the first half-cycle. The maximum acceleration changes into decelerate velocity until the star once again reaches rest position. A

(Continued on page 29)

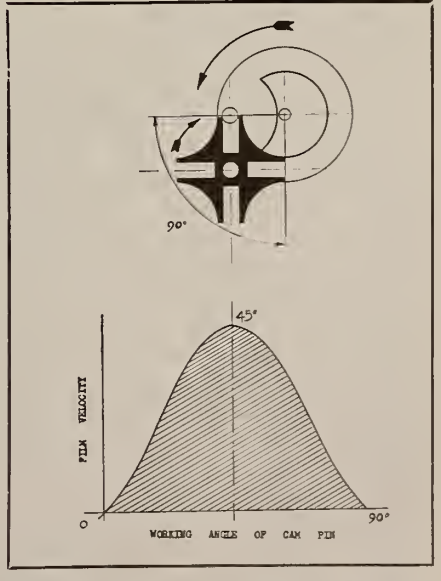


FIG. 6. Curve at bottom shows the velocity generated in the conventional 4-point, radial-slot genevo star illustroted at top.

Cronar, New Du Pont Film Base, Soon to Be in Production

Winter field tests in theatres are scheduled as an additional check before distribution of this film.

THE TIME when "Cronar," Du Pont's new film base, will be regularly used in the manufacture of motion picture release prints is drawing closer. Extensive field tests on this new base, which is a polyester plastic similar to Nylon, have been conducted in theatres scattered throughout the country. The film was found by projectionists to stand up well under hard use, but one objection was brought forth. Some projectionists found that they experienced difficulty in keeping Cronar film in focus.

Further laboratory tests are now being made by Du Pont to determine the exact cause of this problem and eliminate it. Additional field tests will be held this Winter when Cronar-base prints of the film, "Desperate Hours," will be distributed to theatres in several areas. These tests will probably be the final check on Cronar before commercial distribution.

A new Du Pont factory located at Parlin, N.J., will soon begin large-scale production of Cronar film. It has also been announced that the Eastman Kodak Co. has been licensed to manufacture the film base under Du Pont patents.

Thinner Than Acetate

Cronar is different in a variety of ways from the cellulose triacetate base now used almost universally for motion picture release prints. Its principle advantage is that it is tougher than acetate, making it much more resistent to tearing and kinking. Because of its toughness, it can be thinner, allowing as much as 35% more film to be wound on a reel. Cronar base is 4 mils (*a mil is a thousandth of an inch*) thick, compared with the 5.5 mils thickness that is standard for acetate safety film. The cost of shipping film and the amount of storage space required are both reduced.

More significant to the projectionist than shipping cost is the fact that this increased footage per reel will make for fewer changeovers per show. Probably the most important characteristic of Cronar from the projectionist's point of view is its toughness. In laboratory tests using a 6-foot loop of Cronar film, it was found to endure 3,000 runs through a standard 35-mm projector under normal operating conditions with little sign of wear afterwards. A loop of acetate film withstood 1150 runs under the same circumstances.

Both laboratory and field tests were conducted by the Du Pont Co., and the results were described in a paper read by Dr. Deane R. White, of Du Pont, at the Fall convention of the Society of Motion Picture and Television Engineers. The paper was written by Dr. White in conjunction with C. J. Gass, E. Meschter and Wilton R. Holm, all of Du Pont.

Except for one case of equipment failure (the take-up belt broke), reels containing Cronar film were run for more than 300 times in the field tests conducted last Spring without any film breakage whatever, even in the leaders, according to the paper read before the SMPTE. "No perforations broke out, and no repair splices had to be made on the polyester reels," it was said. Leaders of cellulose triacetate film, used for comparison tests in the same theatres, had to be replaced twice or more often before 300 runs had been completed.

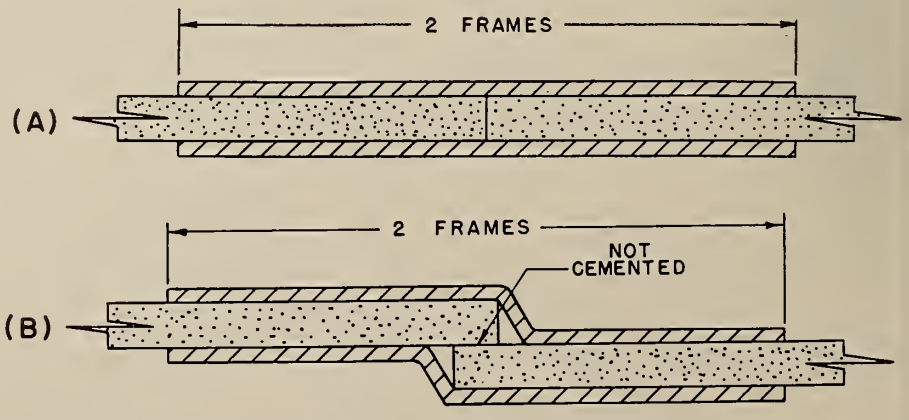
Focus Difficulties

The field tests turned up only one difficulty, it was reported, a tendency of the 4-mil Cronar base to be difficult to focus in some projectors. "Additional high-intensity projection studies are now in progress, and it is expected that evaluation tests in the near future will demonstrate freedom from focus troubles," it was predicted by Dr. White.

Two typical comments from projectionists who helped to test Cronar film in the field follow. Although reported independently and not incorporated in the paper read by Dr. White, these comments are in agreement with his findings.

"This film is very pliable and extremely difficult to break or tear by hand even if folded double," states Jules Margules of the Criterion Theatre, New York City. "Since it is slightly thinner than ordinary stock, you can put about 1,350 feet on a 1,000-foot reel. There is a certain resiliency to the film so that even the pull on the sprocket holes when the motor is started does not undercut or break the film. At the end of the test run, the leaders were not broken nor in need of any patches. We find it to be a big step in the advancement of our industry."

The focus problem was noted by Ted Pylet, of the Hawaii Theatre in Hollywood. "I ran the test film for one 12-hour shift and found it to have a tendency to go in-and-out of focus," he said. "This I believe was due to



This is how extremely thin, adhesive-coated tape is used in splicing where Cronar film is involved. (A) is a butt splice and (B) a lap splice. Since no cementing or welding of the two ends to be joined takes place, Cronar can be joined to itself or to any other film base despite the difference in the chemical nature of the ends to be joined. The "Mylar" tape used for the splicing was also developed by Du Pont. This tape with its adhesive coating is only 1.5 mils, or 1.5 thousandths of an inch, thick.

LETTERS TO THE EDITOR

Request for Information

To the Editor of IP:

Many of the articles in your magazine were of great help to me when CinemaScope was installed in my theatre, so I would like to suggest additional articles that I think would interest me and also other projectionists. I would very much like to read an article about what the theatre of the future will be like. Will they settle on CinemaScope, on a 2 to 1 aspect-ratio picture like VistaVision, or just what?

Have they learned any more about the film cements for the new Cronar base? Will they develop an all-purpose cement to join Cronar to acetate and nitrate bases? I would enjoy an article on that.

Also I agree very heartily with your Monthly Chat in the August issue. We both know that there are bad projectionists just the same as there are bad ministers, bankers, common laborers, etc., but the great majority are sincere, even though they are always getting cussed for a lot of things that are beyond their control.

At the same time, I am a little confused by the number of complaints you hear these days about too much sound volume and bad focus. I have pretty good luck on controlling volume and have good focus on the screen most of the time.

We have 45-ampere Motiograph lamps, Standard Simplex projector heads, and Simplex optical sound. Our screen is 12' x 23½' and we have a 100-foot throw. We use a 1.75/1 aperture and 4" *f*:2 lenses for regular shows and a 2.33/1 aperture and Super Panatar anamorphics for CinemaScope. This is why I am confused: Does our setup come closer to having a good-looking screen (in focus, etc.) than a screen three times as large?

People tell me that they like our single-track optical sound better than stereophonic because they find the stereophonic too loud.

ALBERT POWERS

Ashland, Kansas

EDITOR'S COMMENT: As to the request made in the first part of Mr. Powers' letter — we'll do our best. At least some of the information he requested should be appearing in IP within the next few months.

As to the description of the equipment in Mr. Powers' theatre, and the size of his screen — all we can say is that, in a lot of ways, he has it made. A great deal of present focusing trouble results from the necessity of filling a big, wide screen with fast, short-focal-length lenses. These lenses are as good as they can be and they accomplish their purpose, but by their optical nature, they have little depth of focus. Movement of the film away from the film plane, such as when it buckles from heat, will register on the screen.

The preference of many customers for the sound in Mr. Powers' theatre can probably be attributed partly to the fact that other theatres in the area try to advertise their stereosound systems by cracking people's eardrums.

File of IP for Sale

To the Editor of IP:

I am a member of the craft now associated with the Bell Telephone system, but as projection and all that goes with it will always remain my first love I shall remain a permanent subscriber eagerly awaiting each issue.

I have on hand a good stock of well preserved back issues, and if you can find room in your columns to publish a notice, some interested brother might wish to take advantage of the wonderful information they contain.

The issues are complete from October 1944 to August 1955 with the exception of the following: Sept., 1945; May, 1947; Oct., 1951; July, 1952; Sept., 1953. I will sell the entire stock for five dollars plus the postage or will send c.o.d. to any interested brother.

Formerly with Fox West Coast Theatres, I worked out of Local 762, San Luis Obispo, Calif., and worked for some time with W. Young Louis, affectionately known as "Cholly," about whom you published a very fine article and picture a few years ago.

C. F. ORMOND

195 San Francisco Blvd.
San Anselmo, Calif.

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the fact that the film was not heavy enough to withstand the heat from our carbon arc lamps."

Splicing Procedures

Introduction of Cronar will bring about a change in splicing procedures. An article in the March 1955 issue of IP described in detail a universal splicing method for Cronar and other film bases which employs a perforated tape of "Mylar" polyester film coated with pressure-sensitive adhesive. Mylar tape is chemically similar to Cronar but much thinner. This tape is a truly universal splicing medium because it will make splices without regard to the chemical nature of the two film ends joined.

Alternative techniques for making splices needed in laboratories and exchanges, where use of the tape might not be adapted to processing methods, are in the final stages of development and will be introduced prior to full commercialization of Cronar, it was stated in the paper read before the SMPTE convention. "The chemical inertness of polyester base limits the choice of solvents that can be used to secure a bond of the type commonly made with cellulose ester films," it was stated. "In fact the best splices made with equipment originally designed for cement splicing of films have been made with a cement formulation in which ordinary solvent action appears to play little part."

So far as the projectionist is concerned, splicing problems rising out of the use of Cronar film can be solved through use of thin transparent adhesive tape applied to both sides of the film with the aid of an appropriate splicing apparatus. By lapping a small portion of one end of the film to be spliced over the other and applying the tape, a strong and durable splice can be made. Butt splices can also be made with this tape.

Since no chemical bond between the spliced ends is required—they are held together by the tape and not cemented or welded together—Cronar may be joined to acetate as well as to itself, even though the two bases are of different chemical nature.

Drive-in Growth Continues

A recent report by National Theater Supply on potential theatre construction and equipment sales lays heavy stress on the drive-in field. The report lists about 5000 drive-ins in actual operation today, 600 more in the planning stage, with still another 400 possibilities, particularly in the industrially booming South where milder climate permits year-round operation.

It was noted that the cost of certain major equipment is considerably more for the drive-in than for the indoor theatre. This is especially true as regards projection and sound setups. It is estimated that the total cost of a sound system is several times greater for an outdoor than for an indoor theater of the same capacity. Outdoor screens with supporting towers may cost 20 times as much as an indoor screen. Other drive-in requirements are higher capacity lamps and generators. Film cooling equipment is usually needed.



SO REAL...

On the wide, wide screen make-believe is real, as time stands still. Cost is great for films like this. But so are the rewards—as producer after producer solves problems in production, processing and projection . . . makes use of new technics developed in co-operation with the Eastman Technical Service for Motion Picture Film. Branches at strategic centers. Inquiries invited.

Address: Motion Picture Film Department
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

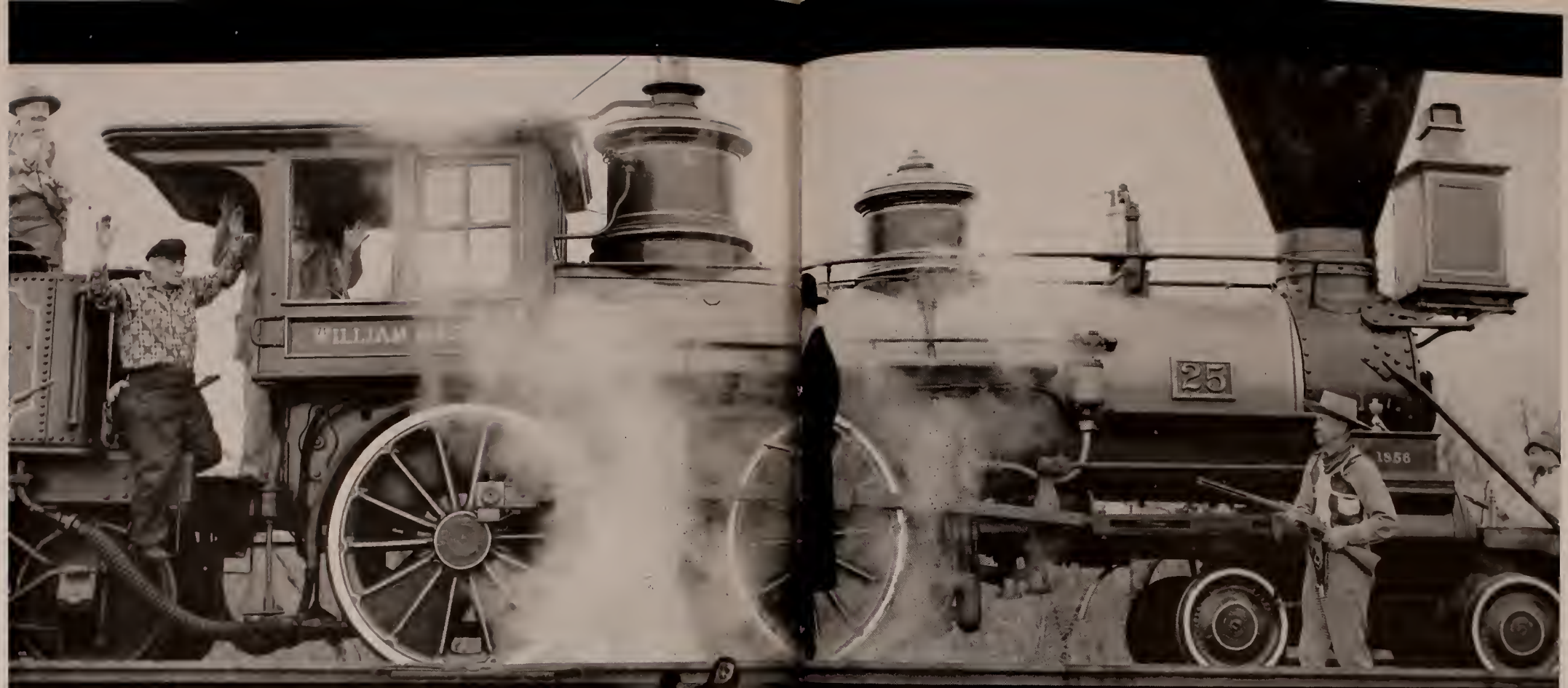


the audience ducked with every shot

East Coast Division
342 Madison Avenue
New York 17, N.Y.

Midwest Division
137 North Wabash Avenue
Chicago 2, Illinois

West Coast Division
6706 Santa Monica Blvd.
Hollywood 38, California



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On the wide, wide screen make-believe is real, as time stands still. Cast is great for films like this. But so are the rewards—as producer after producer solves problems in production, processing and projection . . . makes use of new techniques developed in co-operation with the Eastman Technical Service for Motion Picture Film. Branches at strategic centers. Inquiries invited.

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Hollywood 38, California

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

In The SPOTLIGHT

A STEP forward in labor management relations signalized the recent pact between the IATSE and the major West Coast studios which, among other benefits, provides for a five-day week for 15,000 studio workers. The new collective bargaining agreement establishing the five-day week becomes effective January 30, 1956 and will run through January 30, 1959.

Under the five-day schedule, weekly employes will receive the same pay they have received for six days, with reduced schedules of total hours which can be worked without overtime pay. For example, the 60-hour schedules will be reduced to 54 hours in five days; 54-hour schedules to 48.6 hours; and 48-hour schedules to 43.2 hours.

Time-and-a-half will be paid for studio work on Saturdays for the period from January 26, 1956 to January 29, 1957, with double-time thereafter for the balance of the contract. Daily workers are to receive a 25c per hour increase effective immediately. Both daily and weekly scales will be hiked 2½% on January 30. 1958.

Pension, Welfare Payments

The contract also provides for increased pension plan and health and welfare fund payments. In addition, there is a provision for three-weeks annual vacations for workers after 12 years with one employer.

IA President Richard F. Walsh and Charles Boren. vice-president in charge of industrial relations for the Association of Motion Picture Producers, headed the negotiating committee. Assisting Walsh were the following: George Flaherty and John Ford, IA representatives, and Carl Cooper, second IA vice-president. Hollywood Locals were represented by James Crowe, 44; William Holbrook, 80; W. E. Higgins, 165; Herbert Aller, 659; Alan Jackson, 683; Thomas A. Carman, 695; Wm. L. Edwards, 705; Albert K. Erickson, 727; R. W. Nichols, 728; Ralph W. Peckham, 729; John A. Ward, 767; John W. Lehners, 776; Paul E. O'Bryant, 789; Zeal Fairbanks, 790 and 847; Dillard C. Thomason, 816; Lloyd Ritchie, 818; Miss Kay Lenard, 854.

• Eddie Miller, IA representative and business representative for Local 279, Houston, Texas, recently played host to his daughter, former movie and radio star Nan Grey, and her husband, singer Frankie Laine, when they stopped off at Houston for a visit before returning to their home in Beverly Hills, Calif.

• Los Angeles Local 150 won the first round in its fight against the management of the Paradise Theatre when Superior Judge Walter R. Evans ruled in the Local's favor in denying the exhibitor's request for an anti-picketing injunction and for $115,000 damages. The theatre had been picketed since last April when the two Local 150 projectionists were replaced by a non-union man. The exhibitor's charge of "featherbedding" was not sustained and the court held that the Local's demand for the continued employment of the two union projectionists constituted a "lawful objective."

• We quote here from an article in a recent issue of *The Showman,* a widely-read exhibitor publication in Australia, in which the writer deplores the lack of cooperation in that country between the exhibitor and the projectionist in the purchase of projection equipment.

> The average exhibitor is not a technical person, therefore the advice of the projectionist should be sought, since he (the projectionist) is or should be up-to-date in the knowledge of the latest equipment. When the rounds of the supply houses are made, *both* exhibitor and projectionist should make them *together.*
>
> In large circuits top executives seek advice from their own technicians on the various makes and types of equipment before purchasing. With smaller outfits, however, the tendency seems to be "If I can buy film right, I should be able to buy equipment right. It is no concern of the projectionist."
>
> It *is* the concern of the projectionist. He has to maintain and run the equipment, so it becomes very much his concern. Cooperation in this matter is vitally necessary for both parties.

Fortunately, these sentiments do not necessarily apply to the average exhibitor in this country today. The bitter and costly lessons learned during the past few years with the advent of the new processes when Mr. Exhibitor found himself confronted by a bewildering and conflicting array of projection equipment, has taught him to be a bit more wary in his purchases. He has learned the wisdom of consulting with his projectionist and getting his opinions on the various types of equipment *before* making any purchases. Since the projectionist has to use the equipment, the final choice usually reflects his preference.

IA FOURSOME AGAIN WINS HIGHLY-PRIZED GOLF TROPHY



Repeating last year's victory, members of Toronto Local 173 won the coveted N. A. Taylor trophy in the recent Ontario Picture Pioneers annual golf tournament. Shown here are the members of the victorious team, left to right: Frank Cox, George Georgas, Fred Cross, and Andrew Pura.

• The suits and countersuits between Denver Local 230 and the management of the Evans Drive-In there were brought to a head recently when the District Court issued a temporary injunction against the management enjoining it against any violence to the Local's pickets. Controversy between these two factions began December, 1954, when the Local was notified that the services of the union projectionists were no longer needed as the theatre manager would take over the operation of the machines.

Unable to come to terms with the exhibitor, Local 230 charged breach of contract and established a picket line. Although the exhibitor requested a "temporary restraining order" against the Local's picket line and filed suit for damages, the Court upheld the Local's right to picket the theatre and advertise to the public the existence of a labor dispute.

The damage suit against the Local is still pending, but in view of the fact that the exhibitor was unable to produce evidence in court showing a loss of business as compared with the previous year's business, it is believed that the suit will eventually be dropped. Meanwhile, picketing continues and Local 230 officials are confident that the Evans Drive-In will eventually come into the fold.

25 Years Ago—November 1930

• The IA General Executive Board convened at the Bradford Hotel, Boston, Mass., in conjunction with the AFL convention the week beginning October 6. . . . IA Locals warned to be on the lookout for industrial traveling units using sound motion picture equipment with non-union projectionists. These units were used chiefly for advertising and promotional purposes. . . . O. M. Jacobson, Local 175, Tacoma, Wash., was appointed IA representative by President Canavan. . . . A jurisdictional dispute between N. Y. Studio Mechanic's Local 52 and N. Y. Cameramen's Local 644 was settled by the Board in favor of the Studio Mechanic's Local. . . . The Projectionists Sound Institute at Easton, Penna., was investigated by the National Better Business Bureau, Inc. of New York. In its report, the NBBB revealed a number of inconsistent promises and guarantees offered to prospective students by the Institute.

• The IA has chartered the new Film Exchange Employes Local No. B-63 in Houston, Texas. The Local has an enrollment of 40 members. Similar film exchange IA Locals are located in 32 other cities in the United States and in four cities in Canada. E. J. Miller, IA representative in Houston, will install the charter in the near future.

• Firm in its determination to gain for their members benefits and improved working conditions that prevail in other Local Unions throughout the Alliance, the officials of Detroit Local 199 have been negotiating a new contract with Detroit exhibitors to replace the contract that expired August first last. Pending negotiations, the members have been working without a contract.

Among the benefits sought by the Local are a six-day work week with the existing weekly pay scale; time-and-a-half for overtime pay, and a pension plan which will provide pensions of $75 per month to those members who have worked 20 years when they retire at the age of 65.

National statistics show that wages in the Detroit area are the highest in the country and it is the Local's contention that it is high time its members shared in some of these gains.

Should it become impossible to reach an agreement, Gilbert E. Light, president of the Local, is quoted in the trade press as stating that the matter would be taken before the Michigan State Mediation Board. He further said that the IA has given the Local authorization to take a strike vote, and if the Board fails to resolve the matter, definite steps would be taken in the direction of a strike.

• The hobbies of projectionists are many and varied, ranging in scope from participation in ski tournaments to golf matches. Many have become so proficient in their respective hobbies that they have won championships, as witness the Georgas brothers of Toronto Local 173, who for the past 15 years have consistently walked off with top honors in important ski meets in Canada. The latest top-ranking sports amateur member of the IA to come to our attention is Benno Kusenburger, member of Local 407, San Antonio, Tex. In the recent Brackenridge Park (Tex.) pro-amateur golf tournament. Kusenburger was a member of one of the teams that deadlocked for first place, shooting 63, 8 under par; he also topped the 45 player field.



Benno Kusenberger, recent winner of the pro-amateur golf tournament at Brackenridge Park, Texas.

• New York Local 306 recently concluded negotiations for new contracts with the Loew and RKO circuits and the major Broadway houses calling for a 10% increase. Broken down, the 10% increase covers a wage boost of 7% retroactive to June first last, and an additional 3% increase in the employer's contribution to the Local's welfare fund. The contracts are for four years, from June 1955 to June 1959, and carry the proviso that they may be re-opened at the end of the third year for wage adjustments upwards should business warrant it.

A separate pact was signed with the management of the Rivoli Theatre where the Todd-AO feature. "Oklahoma," is presently being shown. The agreement calls for 11 projectionists. Ten of the projectionists receive $130 per week, and the 11th, a maintenance man, receives $160 per week. The feature, which runs for two hours, is presented twice daily, one show in the afternoon and one in the evening. Projectionists cannot work more than four shows in any given week. The Local contends that the extra manpower and higher pay scale is warranted by the "endless supervision" and special handling of the widescreen equipment.

Herman Gelber, president, headed the Local's negotiating committee. Assisting him were Al Kunze, vice-president; Ernest Lang, secretary; Steve D'Inzillo, NYC business representative; Harry Garfman, Brooklyn business representative; L. Schwartz, financial-secretary, and Abe Kessler, treasurer.

Kodak Sales Reach New High

Sales and earnings of Eastman Kodak Co. for the first three quarters of 1955 were higher than in any corresponding period in the company's history, according to a report issued by Albert Chapman, president.

Consolidated sales of the company's U.S. establishments for the first three quarters, ending Sept. 4, 1955, amounted to $487,284,358, up 13% over $430,846,992 for the corresponding period in 1954. This is 11% above the previous high set in the first three quarters of 1953. Net earnings after taxes for the 1955 three quarters were $57,982,467, up 23% over the $46,958,693 reported in the same period a year ago. Both years broke all previous records.

Chapman said that the company expects business will continue its upward trend during the final quarter of 1955.

Growth of Closed-Circuit Tv Is Aided by Portable Projectors

Efficient TNT organization promotes wide use of projection-Tv in theatres and hotels by using mobile equipment and actively seeking business.

By NORMAN WASSERMAN

THE RECENT closed-circuit telecast of the Marciano-Moore heavyweight championship fight was presented at 133 theatres, drive-ins, auditoriums, fair grounds, and veterans hospitals throughout the nation. A record audience of more than 350,000 viewed the show in 92 different cities, pouring a total of $1,240,000 into the box offices. The Bell Telephone Co., responsible for the line-laying and cable transmission, said that it was the largest and most complicated one-shot network ever used.

Behind this operation was TNT — Theatre Network Television — with Nate Halpern as president. TNT is pushing to broaden the market for this young and growing method of communication and entertainment. Since 1951 TNT has presented 14 championship fights, the previous top gross being $500,000 for the Marciano-Charles fight in September, 1954.

Business Networks

In between fight telecasts and other special events, TNT concentrates on large scale business communications. Through a subsidiary division called Tele-Sessions, TNT enables organizations to conduct meetings and conventions without having to transport a huge audience to one central spot. By making use of the flexible nationwide coaxial cable network of the Telephone Co., Tele-Sessions adapts its services to the unique needs of each individual client.

Not long ago, the Sun Oil Co. introduced a new gasoline to some 14,000 dealers over a network spread out through thirty cities. A TNT Tele-Session also tied together 52 hotel luncheons into an elaborate coast-to-coast celebration of the 50-millionth car manufactured by General Motors. President Eisenhower was televised by closed-circuit from the White House in Washington directly to an invited audience at the Dearborn Plant of the Ford Motor Co.

Tele-Sessions' closed-circuit business communications are designed for organizations of all sizes, says Martin Poll, executive producer of TNT. Networks can be set up nationally, regionally or locally, with receiving locations ranging from one to one hundred. Prospective clients can consult with a trained staff at TNT regarding any aspect of programming and production.

The major problem confronting TNT for a long time was that of mobile projection equipment, Since comparatively few theaters and auditoriums owned their own permanently installed theatre Tv equipment, a large supply of sturdy mobile units was needed for a flexible national operation.

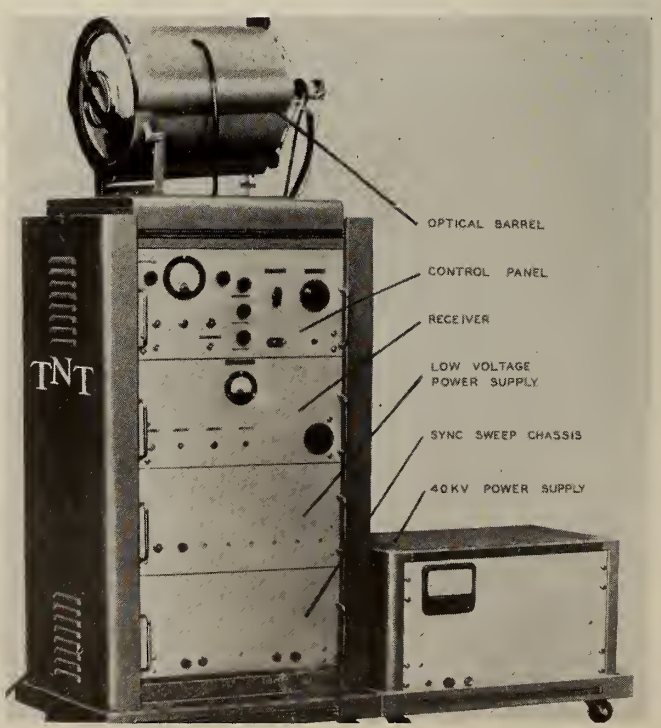
In November 1954 TNT solved this problem by purchasing a half million dollars worth of General Precision Laboratories' newly developed mobile projectors. The total number of units came to 57, 30 of which were the lightweight (700 lbs.) PB 610 model, a completely self-contained projection system used chiefly in hotels and auditoriums. The remaining 27 units were all PB 600 models, weighing 2000 lbs. and consisting of projector, control rack, and power supply, designed especially for larger ballrooms and theatres. Since their purchase they have been used for 16 shows totaling 586 "air hours" without any equipment failure.

Storage, Installation

When not in use, the equipment is stored in supply depots maintained by TNT in major cities throughout the country. When a show is scheduled, the Bell Telephone Co. engineers the job of connecting cables and loops to the various outlets. The actual installation of the projector equipment is performed by the RCA Service Co.

Where the show is a paid admission attraction rather than a business meeting, such as was the Marciano-Moore bout, the projectors are rented to the theatre or other outlet having no permanent equipment of its own. In the case of Tele-Sessions, the equipment is included as part of the overall package production.

The PB 610 is actually a smaller



PB 610 mobile Tv projector manufactured by General Precision Laboratory. Designed chiefly for smaller theatres and auditoriums, the unit is completely self-contained and weighs 700 lbs.

version of the PB 600 model and is expressly intended for smaller audiences. Picture size varies with the throw distance and can be made large enough to be viewed comfortably by 700 persons. The PB 610 works equally well for off-the-air signals and closed-circuit inputs. The picture tube contained in the optical barrel is a five-inch projection kinescope, the image being projected by the usual Schmidt optical system. The ultor voltage for the tube is provided by a regulated high-volltage supply.

The control console is mounted on wheels and contains a control panel, television receiver, sync-sweep chassis, and low and high voltage power supplies. The optical barrel is located at the top of the console. Sweep failure protection circuits prevent destruction of the projection kinescope phosphor in the event the electron beam is deflected or interrupted.

Console Controls

A breakdown of controls and indicators of the various parts of the console is as follows:

CONTROL PANEL: The ON-OFF switch regulates power to the rack console. The high voltage ON-OFF switch regulates power to the high voltage power supply when the ON-OFF switch is closed. Both these switches have pilot lamp indicators. There is also a high voltage pilot lamp indicating when high voltage is applied to projection kinescope, as well as a sweep failure pilot lamp that lights to indicate removal of high voltage due to sweep failure. There is a program selector switch controlling the selection of input signals using three different positions:

(A:) Video input from phone coaxial line.

(B:) RF input from antenna.

(C:) Auxiliary input for phone coaxial line or test signal.

The audio gain attenuates audio for all positions of the program selector switch; in position "B" the audio gain works in conjunction with the audio volume control on the receiver chassis. Then there are the various picture controls for contrasts, focus, vertical hold, and horizontal hold. A control panel meter indicates the kinescope beam current.

RECEIVER: The video control varies the gain of the video amplifier in the receiver chassis. The automatic gain control sets the threshold point of the automatic gain control bias voltage applied to the RF and IF amplifiers. The audio volume control regulates the gain of the audio output stage. There is a channel selector switch that permits the selection of any commercial television station operating on channels 2 through 13. A fine tuning adjustment provides a vernier adjustment of the RF oscillator in the receiver, while a receiving meter indicates when correct tuning of the RF oscillator is obtained.

SYNC-SWEEP CHASSIS: This part of the rack console contains the raster or picture information controls. The vertical and horizontal centering controls center the raster in both directions. The height control regulates expansion and compression in the vertical direction, predominantly affecting the lower half of the raster; while the vertical linearity control performs the same function, but predominantly affecting the upper half of the raster. The horizontal linearity controls 1 and 2 control the linearity at the beginning and end of the horizontal sawtooth waveform (left and right side of picture respectively).

LOW VOLTAGE POWER SUPPLY: This chassis contains no variable controls. Two fuses and pilot lamps are mounted on the front panel. A 5-ampere, 3AG type fuse protects the power transformer primary while a ½-ampere, 3AG type protects the DC circuits.

HIGH VOLTAGE SUPPLY: The high voltage ON-OFF switch controls application of power to high voltage supply. The high voltage control sets the high voltage output level, and the high voltage meter indicates the high voltage output level in kilovolts.

All-Purpose Ace Splicer Announced

An unusually versatile film splicer, designed to handle any gauge motion picture film from 16-to 70-mm and also to splice Du Pont's new Cronar film base as well as acetate, has been developed by Irving Merkur, member of New York Local 306, and head of the Ace Electric Mfg. Co. An added feature of this splicer is that no magnetic material is used in its construction. It cannot injure magnetic sound tracks.

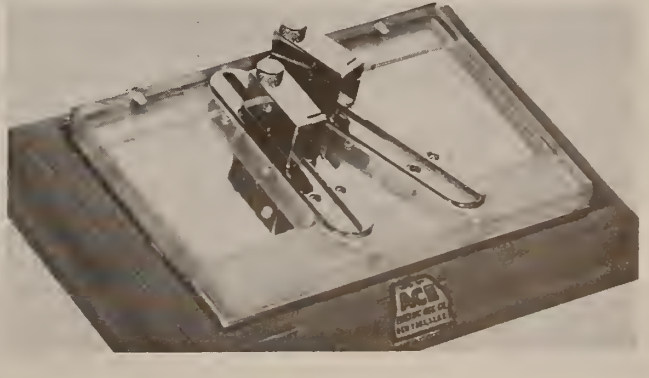
Designed in a new way, this splicer is constructed of aluminum, bronze, and Lucite. Non-magnetic stainless steel cutting blades are the only ferrous metal components. Instead of cement, Du Pont's extremely thin Mylar tape is used as the splicing agent.

The best way to understand how the new splicer works is to examine the accompanying photograph. Register pins are set in the aluminum base plate which can be seen through the transparent Lucite cover plate. The pins are set in such a manner that any type of film can be registered. When the plastic cover is clamped tight, one of the cutter handles appearing at top of the illustration is drawn across the film to prepare the ends for the splice.

The cutter handle placed at right angles to the back of the splicer would be used for splicing motion picture film. The cutter that is offset toward the diagonal is used for splicing magnetic sound tape which this splicer is also designed to join. Sound tape is usually spliced diagonally so that the entire splice does not pass the sound gap at the same moment. This prevents noise.

Mylar Tape Used

As stated above, the splicing agent used is not cement but Mylar tape perforated to conform with motion picture film sprocket holes. Pre-cut pieces of this tape are removed from a paper backing by the projectionist and applied to the film when it is registered in the splicer. The adhesive coating of the tape adheres to the film on pressure and provides an extremely strong splice. More information about this splicing method can be found in an article on Cronar film that appears elsewhere in this issue.



Newly designed Ace splicer is non-magnetic and will handle any size film from 16- to 70-mm. It will also splice Cronar as well as acetate film.

Opinions About Todd-AO

The premiere of the film, "Oklahoma," drew some adverse criticism because the engineers had not fully perfected a new laboratory printing technique before the opening.

FILM critics and technical experts who last month attended the New York premiere of the first Todd-AO production, "Oklahoma," registered a mixed reaction. All considered the picture to be a big, cheerful and attractive show which would keep box-office cash registers ringing, but there was considerable criticism of the screen image delivered by the first Todd-AO print exhibited to the public.

What puzzled some observers was that the picture shown at the Rivoli Theatre had a great many white scratches and distorted horizontal lines. Another print shown privately on the West Coast sometime earlier was unscratched and nobody had reported distortion.

The difference between the New York showing and the earlier test in Hollywood is attributed to the failure of the American Optical Co. to produce a good distortion-correcting print in time for the opening. This printing process was described in the October issue of IP.

The AO factory in Southbridge, Mass., was badly damaged by flood in August and could not bring the final model of its newly designed printer into use quickly enough. The opening date at the Rivoli could not be postponed. The print used for the premiere, according to Todd-AO president Henry Woodbridge, was a trial product of a crude early version of the printer. It was never meant for exhibition to the public.

New Projection Setup

Since the opening, projection methods at the Rivoli have been changed. Instead of using the theatre's regular projection room in the rear of the theatre, which has a very steep angle of throw, an additional booth, built into the front of the mezzanine, was put into use.

This booth has little or no projection angle, so the corrective print was not required. A contact print, similar to the one shown earlier in Hollywood, was used, and a much better picture resulted.

The corrective printing process, developed by Dr. O'Brien of the American Optical Co., has not really been tested publicly. This will have to wait until the American Optical Co. delivers a perfected product from their new printer, a print with built-in distortions designed to counterbalance the distortion inherent in projecting a picture on a deeply-curved screen from a sharp angle.

The following excerpts from reviews in the New York papers are typical of press comments on "Oklahoma" and the Todd-AO projection process:

The Times, *Bosley Crowther*

"At long last, 'Oklahoma!' . . . has been brought to the motion picture screen in a production that magnifies and strengthens all the charm that it had upon the stage . . . Inevitably, the question which leaps to every mind is whether the essential magnificence and gusto of the original has been retained in the sometime fatal operation of transfer to the screen. And then the question follows whether the mechanics of Todd-AO which is being inauguarted with this picture, are appropriate to articulate this show . . . To the first question, there is only one answer: . . . a full-bodied 'Oklahoma!' has been brought forth in this film to match in vitality, eloquence and melody any musical this reviewer has ever seen . . . To the question of whether the dimensions and the mechanism of Todd-AO are appropriate to the material, one can only say that the serious expanse of screen is fetching, but the system has disconcerting flaws."

Tribune, *William K. Zinsser*

". . . Fortunately the movie is true to the original . . . and Todd-AO takes the moviegoer out of his cramped theater seat and onto the rolling farmland . . . The effect is not completely three-dimensional, but there is a good illusion of depth . . . The figures on the screen are tremendous, and the close-ups are so sharp in detail that the texture of skin and clothing, the sheen of a girl's hair, are almost real enough to touch. The colors are vivid, and the movie has many striking landscapes . . . But Todd-AO is best in closeups."

World Telegram, *Alton Cook*

" 'Oklahoma' seems likely to become as much of a box office milestone in movies as it was in stage annals. The glamour of the title and music should keep the picture in the newly refurbished Rivoli for months . . . News about Todd-AO is less cheery . . . Level settings run downhill toward the edge of the screen, an affect that is particularly disconcerting in dance numbers."

National Circuit to Sponsor Cinemiracle Process

An aggressive expansion by the National Theatres circuit into the new "roadshow" type of film presentation, emphasizing use of complicated projection techniques, was recently announced in Los Angeles by Elmer Rhoden, president.

Rhoden stated that National will make an expenditure of $5,000,000 in perfecting its new Cinemiracle process and bringing the first product to the screen. Subject to government approval, the National circuit will sponsor production of Cinemiracle features in addition to converting some of its theatres for their exhibition.

The Cinemiracle system uses three projectors as does the now-familiar Cinerama system and would obtain much the same kind of effect on the screen. It is believed to have practical advantages over the latter system because the three film strips are projected from a single central projection room rather than from three different locations in a theatre. This saves seating space and makes installation easier. The first feature to be filmed in the Cinemiracle process will be produced by Louis de Rochemont, producer of the current "Cinerama Holiday."

Rhoden also reported that National is expanding its present theatre holdings, citing the recent acquisition of the Joe Laurence circuit or six indoor theatres and one drive-in in the Salt Lake City area. The Department of Justice approved the acquisition of the theatres under the terms of the consent judgment aimed at ending monopolistic practices in the motion picture field.

National will also acquire, subject to government approval, a drive-in at Las Vegas, Nev., and has bought five-acre sites at Van Nuys, Calif. and at another Western location for the construction of what is described as a "new type or modern motion picture theatre."

OBITUARIES

A C. (Slim) Mayes, 54, member of Local 612, Abilene, Texas, died last month at his home following a heart attack. He worked in the projection room of the Key City Drive-In Theatre in that city. A native Texan, Mayes began his show business career back in 1920 when he joined a "rep" show as a clarinetist. About 1927 he played with the John Philip Sousa band but not finding a bandsman's life to his liking, he left that organization after a winter tour and returned to his first love—vaudeville. He traveled to Columbia, Mo. in 1935 where for a number of years he played the clarinet and violin in vaudeville theatres. He returned to Abilene in 1952 where he remained until his death. Survivors include his wife, four children, and his father.

Lawrence J. Shafer, 67, charter member and former officer of Local 160, Cleveland, Ohio, died recently after a short illness. He was a member of the Local for the past 45 years, and at the time of death held the office of trustee. Shafer was an ardent golfer and was widely known as a photographer of golf stars and of golf courses. He was an active Mason and held membership in Concordia Lodge, Hillman Chapter, Holyrood Commandery, Lake Erie Consistory, Al Sirat Grotto, and Al Koran Shrine. Survivors are his wife, son, and two grandchildren.

Harry Akerly, 69, veteran member of Pittsburgh Local 171, died recently. He was the father-in-law of Phil D'Ivernois, head of the sound department for Stanley Warner in Pittsburgh.

Martin Vallapadierna and Fritz Grun, members of San Antonio Local 407, died within one week of each other. Villapadierna, a member of the Local for 39 years, was 63 years old when he died on September 27 following a lengthy illness. Grun, a member since 1945, died on October 2.

Charles Clark, 67, member of Local 386, Columbus, Ohio, since 1938, succumbed to a heart attack on September 24. For the past 15 years he worked as projectionist for the Miles circuit. He is survived by a son, daughter, and three grandchildren.

16-mm Shutter Conversion Kit

The Victor Animatograph Corp. of Davenport, Iowa, has announced a shutter conversion kit for its 16-mm projectors produced since 1942. The light increase is estimated to be 38% over the three-interruption type shutter used on previous models of Victor projectors. The new Victor Mark II two-interruption shutter breaks the light beam 48 times per second compared to the old three-interruption shutter which breaks the beam 72 times per second at sound film speed.

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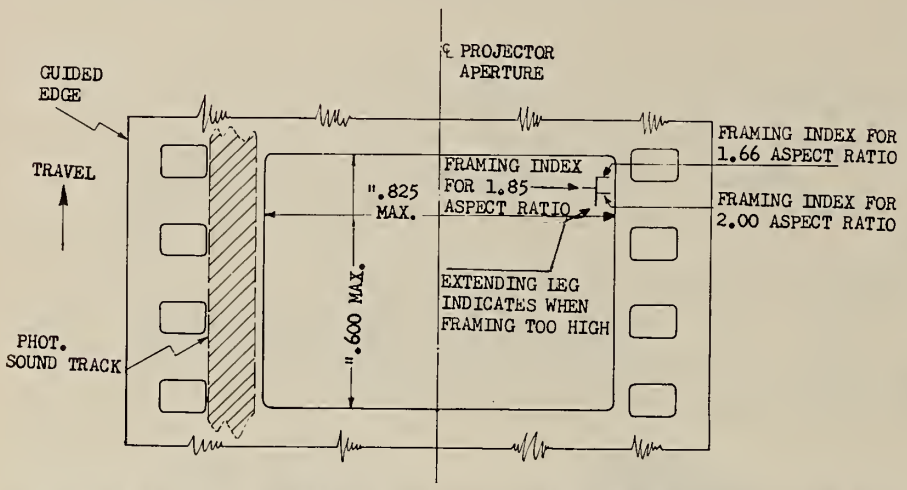
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Framing Index for Wide-Screen Pictures



New framing index for non-anamorphic wide screen pictures may be seen at upper right hand corner of frame in diagram.

A FRAMING index to cue projectionists for correct framing of unsqueezed wide-screen pictures projected through a cropped aperture has been developed by Paramount Pictures and recommended to all studios by the Motion Picture Research Council. Lack of such a system of markings has been responsible for the heads or feet of a screen image being cut off unnecessarily. This happens even if the picture has been correctly photographed for a wide-screen ratio, and the projector aperture is of the proper size.

In the procedure described here, the framing index marks appear at the head end of each 2,000-foot reel of release print. Shown in the upper right-hand corner of the accompanying diagram, this framing index appears twice, in the same manner as the changeover cues. Its first appearance is 12 feet after the start of the reel for 12 consecutive frames, and again 8 feet after the first appearance for 14 consecutive frames.

How to Read Index

When the upper horizontal line extending to the right is framed at the top of the screen masking, the picture will be correctly framed for an aspect ratio of 1.66/1 or 1.75/1. When the horizontal line extending to the left is framed to the top screen masking, the picture will be correctly framed for an aspect ratio of 1.85/1. When the lower horizontal line extending to the right is framed to the top screen masking, the picture will be properly framed for an aspect ratio of 2/1.

If the picture is being projected in the old aspect ratio of 1.33/1, the picture should be framed as in the past, namely the top of the picture image should be framed just above the top screen masking.

In using the framing index, the projectionist will make the changeover exactly as in the past. He then has time to glance at the picture, check the arc and make sure that everything is performing correctly. After this check, he again looks out the port and sees the first framing index. If the picture is still not correctly framed for the aspect ratio being used, he changes the framing position the desired amount and watches for the second framing index. This verifies the framing or indicates whether further adjustment should be made.

All of the index marks for any one picture are located in the same relative position on the frame. In practice it is then only necessary for the projectionist to make his framing correction at the start of the first and second reels. The framing should be correct on all subsequent reels as long as the framing control has not been changed.

The position of the framing marks may vary slightly from picture to picture, depending upon the manner of shooting and the head room allowed in the original photography. The position of these index marks will, of course, be established by the respective studios to comply with their practice.

The timing intervals were established after a series of tests with projectionists who had gained familiarity with this system. We believe it allows adequate time without unnecessary waiting at the port.

The index marks are scribed on the negative and will appear on all prints. The little leg extending down from the 2/1 position was placed there so that the projectionist would see a signal even when his framing was too high. This is then the signal for him to frame down.

Aluminum Plate Screen for Drive-Ins

A SCREEN fabricated of extruded aluminum panels was recently developed by the Motion Picture Research Council for use in drive-ins requiring greater picture brightness and broader horizontal light distribution. The screen is being installed in a number of large new drive-ins throughout the country.

With the advent of the wide screen and because many outdoor theatres already had extremely wide horizontal viewing angles, it was felt by the Research Council that a special type screen had to be devised which would permit all locations within the viewing area to see a brighter picture. What was needed then was a directional screen with a fairly high brightness gain and a distribution of about 45 degrees on each side of center.

Fluting Controls Light

After a series of trials and errors, it was decided to combine vertical aluminum fluting with proper surface diffusion. The final light distribution in horizontal and vertical directions is a function of the two dependent variables, flute shape and surface diffusion. The surface diffusion primarily determines the gain and vertical distribution. while the fluting is primarily responsible for the horizontal light distribution.

The required surface diffusion previously provided by a specific paint formulation was duplicated by direct physical and chemical processing of the aluminum surface. This resulted in much experimentation, for many critical factors, optical and otherwise, developed.

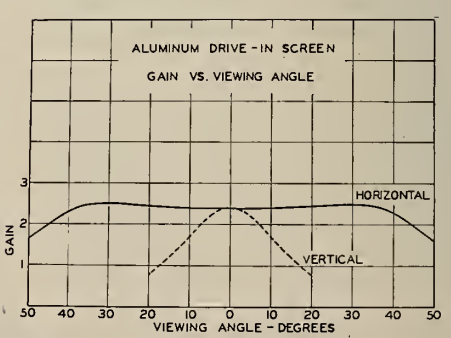


Chart showing the horizontal and vertical brightness distribution of the Research Council screen.

The accompanying chart shows the horizontal and vertical brightness dis-

(Continued on page 32)

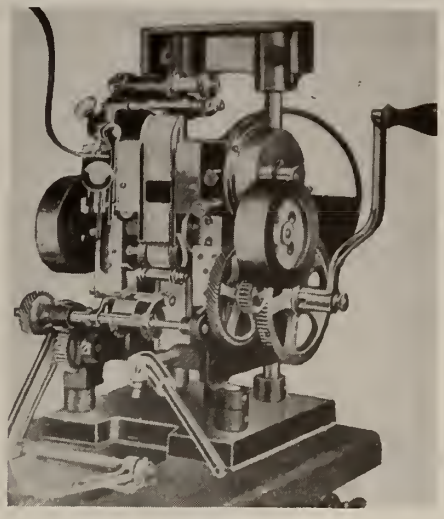
Ray Brian — Motion Picture Historian

WE PRESENT here another portion of Ray Brian's unique collection of data on the history of motion picture equipment. The following listing is the fifth installment of a series and brings the total number of projectors listed so far to 114.

Ray Brian is a member of Local 434, Peoria, Illinois. He is constantly in search of new additions for his already extensive collection of over 350 items. With the exception of those listings marked here with an asterisk, he has photographs, and in many instances, actual possession of the equipment named. IP readers who may have additional information are urged to contact Ray Brian through this publication.

Following is the listing for this month:

GARDINER—made in Calumbus, Ohia.
G and B—mode by Gaumant British Ca.
GAUMONT—Lean Gaumont, Paris, 1902.
GRAND—made by Bell & Hawell Ca., abaut 1930.
GRAPHOSCOPE—Charles Jenkins, 1916.
GRANDEUR—Internatianal Praj. Co., 70-mm, 1928.
GRAY—Robert Gray, gloss plate projectar, 1895.*
GREENE—Wm. Frieze-Greene, 1912.



Lubin's "Marvel"—1912 madel.

HAHN—made in Germony, abaut 1910.
HALL—made abaut 1920.*
HALLBERG—made abaut 1922.
HARVARD—mode abaut 1900.*
H and B—made by Homilton & Baker in Australia, since 1922.
HELIOS—Helios Projector Co., Chicaga, Ill., abaut 1926.*
HIGGINSON—made in England, 1921.
HOLMAN—Arthur J. Holmon, 1920.
HORTSON—mode in Fronce, 16-mm and 35-mm cambinatian, 1952.
HYPNOSCOPE—mode abaut 1900.*
ICA—Carl Zeiss, Germony, 1909.
IKON—Corl Zeiss, Germony, 1930.
IKONOGRAPH—Jahn Loggren, New Yark City.*
IMPERATOR—made in Germony by Ernemonn.
IMPERIAL—mode by English Pathe Ca., 1910.
IMPERIAL—mode in Englond by Imperiol Sound Ca., 1935.
INDOMITABLE—Tyler Apparatus Ca., 1914.
INTERNATIONAL—mode in Japan, Ernemann design.
INVICTA—Naakes & Normon, London, 1897.
INVICTA—mode in England by Kalee Co., 1930.

Electronic Lens Tester

RCA has announced the development of an electronic instrument which will enable optical scientists to evaluate and grade the performance quality of lenses in objective mathematical terms. Until now, a spokesman said, lens sharpness, contrast and gradation has been determined solely by visual tests.

Hilux Lens Price Reduced

Projection Optics Company is now offering its Hilux 264 and Superlite Lenses at a special combined price of $475 per pair.

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Of a completely new and simple design, the versatile "Clear Vision" splicer will solve any splicing problem that comes up in the projection room. Instead of liquid cement, extremely strong "Mylar" tape, only 1.5 thousandths of an inch thick, is used as the splicing agent. This tape is available in rolls or in pre-cut portions for either 35-mm or 16-mm film. The sturdy splicer is completely non-magnetic because it is constructed of aluminum and lucite and has non-magnetic stainless steel cutting blades. Designer and manufacturer is the Ace Electric Mfg. Co., producer of many high-quality products for the projection room.



Ace Clear Vision Splicer

For more details write: Camera Equipment Co., 1600 Broadway, New York 19, N. Y.

What Do You Know About Carbons?

The fourth of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data provided by National Carbon Company.

Determining Screen "Brightness"

If the light intensity in foot-candles and the reflecting power of the screen are known, the "brightness" of the screen in "*foot-lamberts*" can be determined by multiplying the foot-candle values by the reflecting power of the screen.

For a screen of known reflecting power the light intensity in foot-candles necessary to obtain a given brightness in foot-lamberts is determined by dividing the foot-lambert value desired by the reflecting power of the screen.

Since a motion picture screen is ordinarily brightest at the center, the specification of brightness of a particular screen should include values not only for the center but for the sides and perhaps the corners as well.

ASA Viewing Standard

In order to ensure a sufficient screen brightness for proper viewing conditions the American Standards Association (Standard Z22.39-1944) has specified:

"The brightness in the center of the screen for viewing 35-mm motion pictures shall be 10 $^{+4}_{-1}$ foot-lamberts when the projector is running with no film in the gate."

In other words, the brightness in the center of the screen should be within the range of 9 to 14 foot-lamberts. For a perfectly diffusing screen of 75% reflecting power, the incident light to meet these conditions should be within the range of from 12 to 18.7 foot-candles.

Which Carbon Produces Light?

The light used in projection all comes from the incandescent crater face of the *positive carbon*, the brightness of which is determined by its temperature.

Since carbon vaporizes at a temperature of about 3,670°C, further increase in current beyond the value which produces this temperature does not increase the crater temperature and brightness but increases only the area of the crater up to the full cross section of the carbon without spindle.

If the current is increased the carbon consumption is increased proportionately. The phenomenon is the same as that of the three-minute egg. You can turn up the gas and boil the water away more rapidly, but the temperature remains the same in the pan and the three-minute egg is still a three-minute egg. In practical operation the upper limit of crater brilliancy in the low intensity D.C. arc is approximately 17,500 candles per sq. cm.

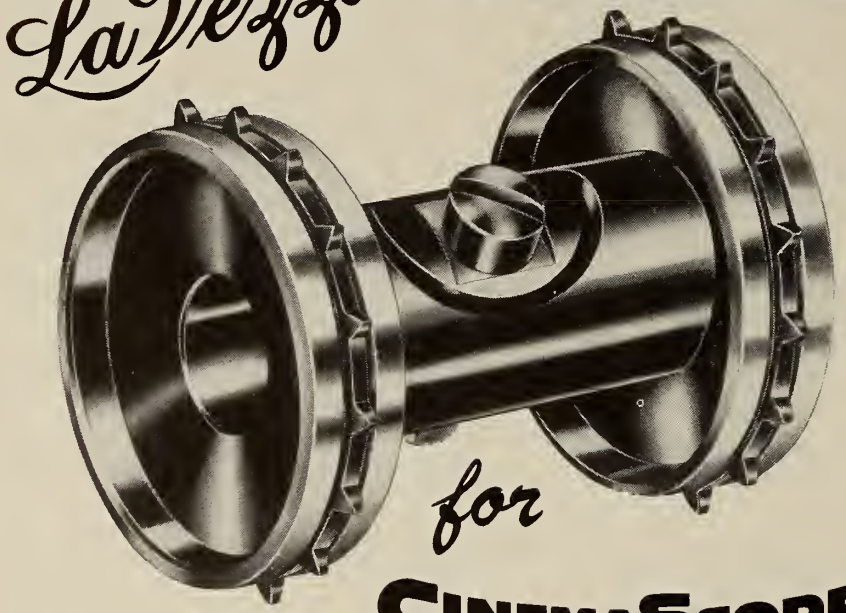
Differences Between High And Low Intensity Arcs

In the high intensity arc the core of the positive carbon is relatively larger than in the low intensity arc and contains rare earth materials which become highly luminescent under the action of the electron bombardment in the arc stream.

The current density in the positive carbon is also increased to values which may exceed 1,500 amperes per square inch. At this high current density the material of the core is vaporized more rapidly than that of the outer carbon shell until a deep, cup-like crater is formed in the face of the carbon.

Within this crater vapors of carbon and core materials are excited to a very high temperature and radiating

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efficiency. The effect of this action is to produce a brightness within the crater cup several times that possible at the positive crater of the low intensity carbon arc.

Clear-Screen Image Requirements

A clear screen image requires a screen brightness conforming to the A.S.A. Standard Z22.39-1944 of 10 $^{+4}_{-1}$ foot-lamberts with the projector running and no film in the gates. Low intensity projection lamps will not provide this amount of light on the screens of many neighborhood houses.

Effect of Light on Color Film

The audience sees on the motion picture screen only those colors that are present in the projection light and which remain after others are absorbed by the color film. If certain colors are absent from the light, no trick in the film can put them on the screen; the film can only absorb or transmit light. It cannot create colors in any other way.

On the other hand, excess of certain colors in the light source likewise distorts the natural hues of color features. High intensity carbon arc projection assures an evenly balanced light with all colors present in essentially equal intensity.

[TO BE CONTINUED]

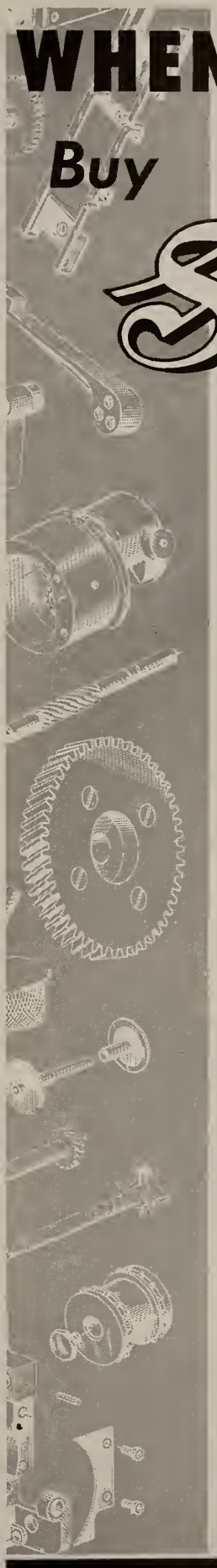
FASTER INTERMITTENTS

(Continued from page 15)

symmetrical curve is thus developed in the conventional geneva movement.

Figure 7 shows the plotted curve for the eccentric-star intermittent with slanting, or non-radial, slots. The curve plotted in Fig. 7 reveals at a glance the extended acceleration of pulldown in the eccentric-star movement during the first half of the cycle. The following half pulldown cycle shows a rapid deceleration from the top of the curve (45 degrees) to rest position (90 degrees). The curve generated is accordingly *asymmetrical.* This is the main advantage of the eccentric-star intermittent movement.

It is desirable, of course, to accelerate the film slowly from zero position to maximum acceleration of the film in order that gate pad tension can be overcome at the start of the pulldown. The eccentric star also has the advantage of a quick return to rest position, bringing the film to rest by the time that the master



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blade of the occulting shutter opens to let light pass through the film.

The eccentric-star intermittent no doubt has a few disadvantages, such as necessity of operating the machine in only one direction of rotation at all times. Another disadvantage of the eccentric star is the proximity of the slots to the curved edges of the star. This defect can be corrected with a larger, flanged star, and amounts to little more than a matter of experimental work.

The writer feels that the eccentric-star intermittent movement is far superior to any other intermittent mechanism of the geneva type in approaching the optimum 60-degree pulldown. An outstanding advantage of the 60-degree pulldown is that it makes possible the use of a 3-blade shutter with 60-degree openings to give a 72-cycle cutoff frequency with 50 per cent light transmission.

Geneva movements for 16-mm. projectors are far superior to claw intermittents for many reasons. A particular advantage of geneva-type mechanisms is the placement of star and cam in an oil-filled housing for quiet operation and a long life of satisfactory service. Isolation of mechanical shocks generated in these mechanisms by large forces of acceleration may be accomplished by using two separate, but interlocked, synchronous motors, one for the intermittent and the other for the continuous film-drive and sound-head.

Useful data for the calculation of these high-speed intermittent movements are scattered through a large mass of technical literature. Among the many articles that provide good examples of the problems encountered in this interesting field of motion picture engineering are "Mechanisms for Intermittent Motion" by Otto Lichtwitz in *Machine Design* (December 1951, January, February, and March 1952); "The Application of Pure Mathematics to the Solution of Geneva Ratios" by R. W. Jones, *SMPTE Journal* (July 1946); "Design Factors in 35-mm Intermittent Mechanisms" by Arthur Hayek, *Journal of the SMPTE* (November 1947), and "Fast-Cycling Intermittent for 16-mm. Film" by Warren R. Isom, *Journal of the SMPTE* (January 1954).

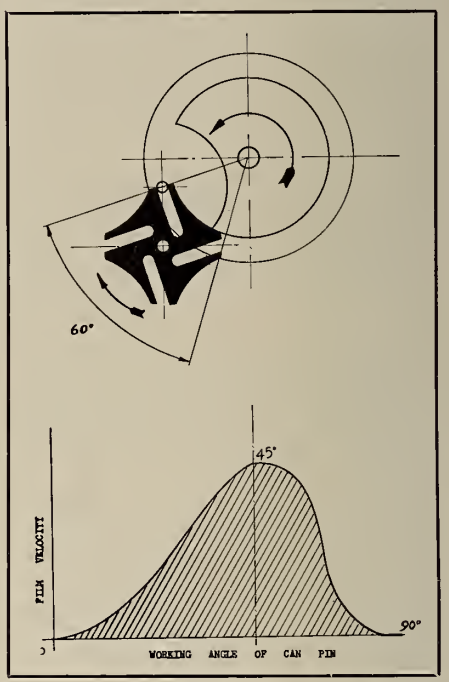
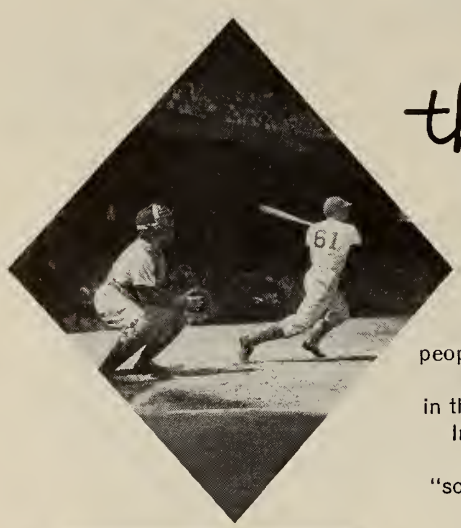


FIG. 7. An eccentric-star intermittent with slanting, or non-radial, slots. The asymmetrical curve plots the velocity of this movement during pulldown.



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55-MM C'SCOPE NEGATIVE

(Continued from page 12)

studio. And what they actually saw was a screening of a 35-mm reduction print from the 55-mm negative. They were so enthused with the wonderful quality of this new medium, Halpin says, that they immediately decided to discontinue the protective photography by the 35-mm camera.

Await New Cameras

"As more of the new cameras and lenses are produced," he said, "more 20th Century-Fox productions will be scheduled for shooting in the new 55-mm medium. However, we shall continue to shoot CinemaScope productions with our regular 35-mm cameras.

"Nor will our swing to production on 55-mm film affect the more than 30,000 CinemaScope installations in theatres throughout the world. On the contrary, use of the new camera and larger negative will result in a great increase in the pictorial quality of our productions, when the 55-mm negative is reduced to 35-mm for projection in conventional CinemaScope theatres.

"While some 'showcase' theatres will be equipped with 55-mm projectors and custom-tailored screens, plus additional sound equipment to utilize a seven-track stereophonic sound system, this will be for the purpose of obtaining the ultimate in theatre presentation. The screen aspect ratio will remain unchanged. 20th Century-Fox regards the present ratio of 2.55-to-1 as eminently satisfactory for viewing, audience participation and story-telling purposes.

Elaborate Sound System

"The new seven-track stereophonic sound system will utilize five horns placed in pre-determined positions behind the screen. Of the remaining two tracks, one will serve as a control track and the other a special sound speaker."

Whereas present CinemaScope equipment has improved the viewing of pictures in theatres, the new lenses and wide film that will be used in exhibiting films in the roadshow houses, Halprin said, will produce another great improvement in definition and depth.

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ALUMINUM SCREENS

(Continued from page 26)

tribution of the Research Council screen. The horizontal distribution is adequate to 45 degrees. Fortunately, the required vertical angle for drive-in theatres is very small. A good 90% of the viewing positions are within plus-or-minus 5 degrees of the direction of peak reflection. However, for best results, the screen should be tilted to the proper angle to place the peak of the vertical distribution curve near the center of the viewing area.

Aluminum extrusions were chosen for surface fabrication because of their durability and easy installation. It was found that anodized aluminum withstands the effects of the weather better than anything else. For installation, a flange is provided along one edge of the extrusion panel for attachment to the screen tower.

Washing Important

The ultimate life of the finished surface depends, to a large degree, upon the washing schedule. Kept free of chemical deposits by frequent washing, the surface will last indefinitely, it is claimed.

In tests conducted by the Research Council, their screen was compared with a flat-surfaced white screen. The Council's light meter indicated that the fluted aluminum screen returns much more light in addition to affording wider horizontal distribution. The screen is manufactured under license from the Research Council by Manco-Vision, of Butler, Wis., and priced at $1.85 per square foot.

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ARCLAMP RECTIFIERS

(Continued from page 10)

the AC supplied by the power company, fluctuations in line voltage and power factor can come through to the arc-lamps and show up on the screen.

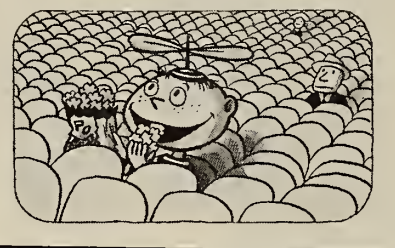
Imbalance in the rectifying efficiencies of the two half-wave components of a rectifier will effect projection quality. Beat-frequency flicker results from this imbalance. Two diode tubes or two stack units may not have exactly equal current-outputs, particularly when old tubes or stacks are operated in combination with new ones. Even 3-phase rectifiers can produce this kind of flicker when the tube or stack circuits are electrically unbalanced.

The operation of rectifiers is simple, necessitating the observance of only a few precautions. Because a separate rectifier is required for each projection lamp (2 rectifiers for a 2-projector installation), there arises the question of turning each rectifier off when not in use or leaving both sets on for the duration of the show. In general, mercury-vapor tube rectifiers are left on (filaments lighted) throughout the show, for this type of rectifier needs at least 3 minutes warmup time before it is ready to deliver current to the arc-lamp.

Tube Rectifiers

Tube rectifiers having tungar diodes may be left on continuously or shut down when not in use *according to the manufacturer's recommendations.* In cases where the arclamp table switch is discontinued (left "on" and

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the handle removed to prevent control of the arc circuit at this point), the circuit is "made" and "broken" by means of the large radial-switch knob on the rectifier itself. This knob also permits the projectionist to select the proper current (amperes) for the carbon trim he is using. Tungar-tube rectifiers having this method of DC-circuit control are, of course, turned off completely to extinguish the arc and turned on again when the time arrives for relighting the lamp. Such rectifiers should be installed as close to the projectors as possible—preferably beneath each lamphouse.

Tungar-tube rectifiers are also available which allow the DC arc circuit to be made and broken by the usual method, that is, with the table switch. This is true of all the rectifiers made for 3-D projection. Both rectifiers are turned on just before starting the show and are left on until the conclusion of the performance. The filaments of the diodes are thus kept lighted continuously, and not turned on and off for each reel.

Tungar filaments do not sag appreciably nor deteriorate by being burned continuously. Tube life is not shortened, as all the "wear and tear" occurs only when current is actually being rectified. There is also no danger of overheating the rectifier transformers when the filaments are kept lighted: the amount of current consumed by the filaments is very small in comparison to the full-load current consumed by the arclamps. There may be a separate small filament transformer in each rectifier, or else a few additional turns of wire on the secondary winding of the main transformer furnish the filament current.

There is little reason to fear that breaking the DC circuit by means of the arclamp table switch will develop a surge of current, due to transformer reactance, that will cause flashover and damage to tungar rectifying tubes. Mercury-vapor tubes, on the other hand, are apt to flash over on slight provocation; but the use of a large filter condenser connected in shunt with the DC output leads effectively "damps" such surges in all types of rectifier.

It is essential to bear in mind that the filament voltage of tungar-tube rectifiers should remain constant, *and at full value*, even when arc amperage is changed. Most rectifiers of this type, in fact, are designed to supply full rated filament voltage at all times regardless of the prevailing plate current. *No perceptible dimming of the diode filaments should occur either when the arc is struck or when arc current (amperes) is varied to suit different trims of carbons.*

The primary windings of most rectifier transformers are provided with several taps to compensate for line voltage which is consistently higher or lower than normal. Normal voltages are 115 and 230 volts, but these can vary from 110 to 120 volts in the first case, and from 220 to 240 volts in the second.

Injury from Voltage Drop

Strange as it may seem, tungar tubes are injured by *undervolting* the filaments. A few projectionists, knowing that the life of an ordinary incandescent bulb may be greatly prolonged

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by reducing the voltage at which it is burned, have mistakenly believed that tungar diodes may be similarly preserved. The opposite is true. Destructive positive-ion bombardment of the filament increases whenever filament voltage is lowered, the impedance of the plate load (resistance of the projection arc) remaining unchanged.

It often happens that reduction of tungar filament voltage results in erratic DC output: in all cases continued operation under these conditions produces deterioration of all tubes in the rectifier accompanied by the development of marked differences in the outputs of the 2, 4, or 6 tubes of the set. The picture on the screen then suffers from flicker and loss of brightness, and the arc-feed control may become unmanageable.

Never reduce tungar-tube filament voltage as a means of reducing arc current! Never close the lamp table switch and attempt to strike the arc unless the tungar filaments are burning at full voltage! To ignore these rules may result in destruction of the tubes. Damage can be prevented by making sure that the filaments are burning at FULL RATED VOLTAGE before plate current (DC) is taken from a tungar-tube rectifier!

When 3-phase rectifiers are used, ripple in the DC output which is sufficiently low in frequency to make the screen illumination flicker may be traced to differences in the outputs of the different diodes. Tungar tubes are most easily checked by substituting new tubes for old or suspected ones. Should output voltage drop and flicker develop during a show, a whole new set of bulbs should be put into service, the ones taken out checked later to find the defective ones. A minimum of flicker is good evidence that the outputs of the tubes are nearly equal, although voltmeter tests of the individual tubes constitute the most accurate indication of performance.

No Preheating Required

Unlike tube outfits, junction-type rectifiers require no preheating, but are tuned on only when needed. In practice, the transformer primaries of nearly all 3-phase stack rectifiers are left connected permanently to the AC power line. Current drain is negligible until rectified power is consumed by the arclamps.

The best insurance for proper operation of all stack rectifiers is good ventilation and the avoidance of overloads. The safety of a rectifier depends upon the ventilating fan — an item which should be inspected frequently. Rectifying stacks, whether they be copper oxide, sulfide or selenium, can be completely destroyed through heat in the event of fan failure. Continued overloads generate heat, and should therefore be avoided. The life of junction-type rectifiers is considerably lengthened by installation in a cool, dry location.

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1. The names and addresses of the publisher, editor, managing editor, and business managers are:

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Editor: JAMES MORRIS, 19 West 44 Street, New York 36, N. Y.

Managing Editor: R. A. ENTRACHT, 19 West 44 Street, New York 36, N. Y.

Business Manager: R. A. ENTRACHT, 19 West 44 Street, New York 36, N. Y.

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R. A. ENTRACHT, 19 West 44 Street, New York 36, N. Y.

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R. A. ENTRACHT, Business Manager

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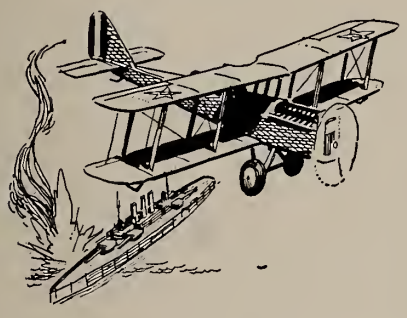
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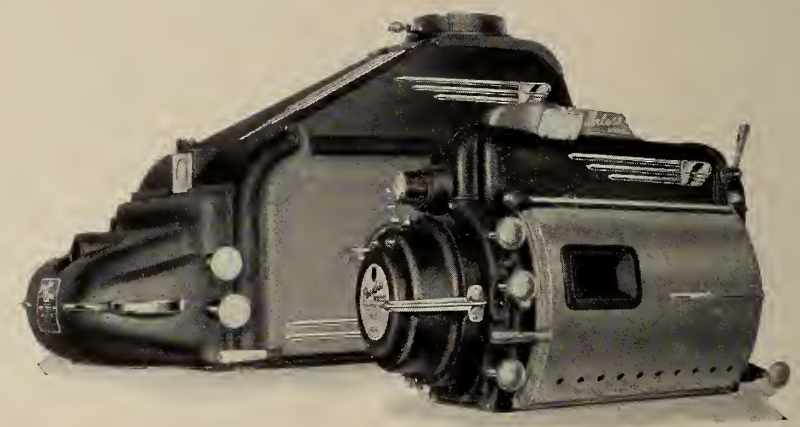
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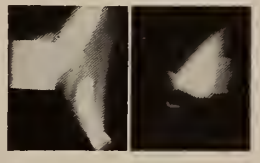
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9E

Monthly Chat

Looking Backward Over the Past Year

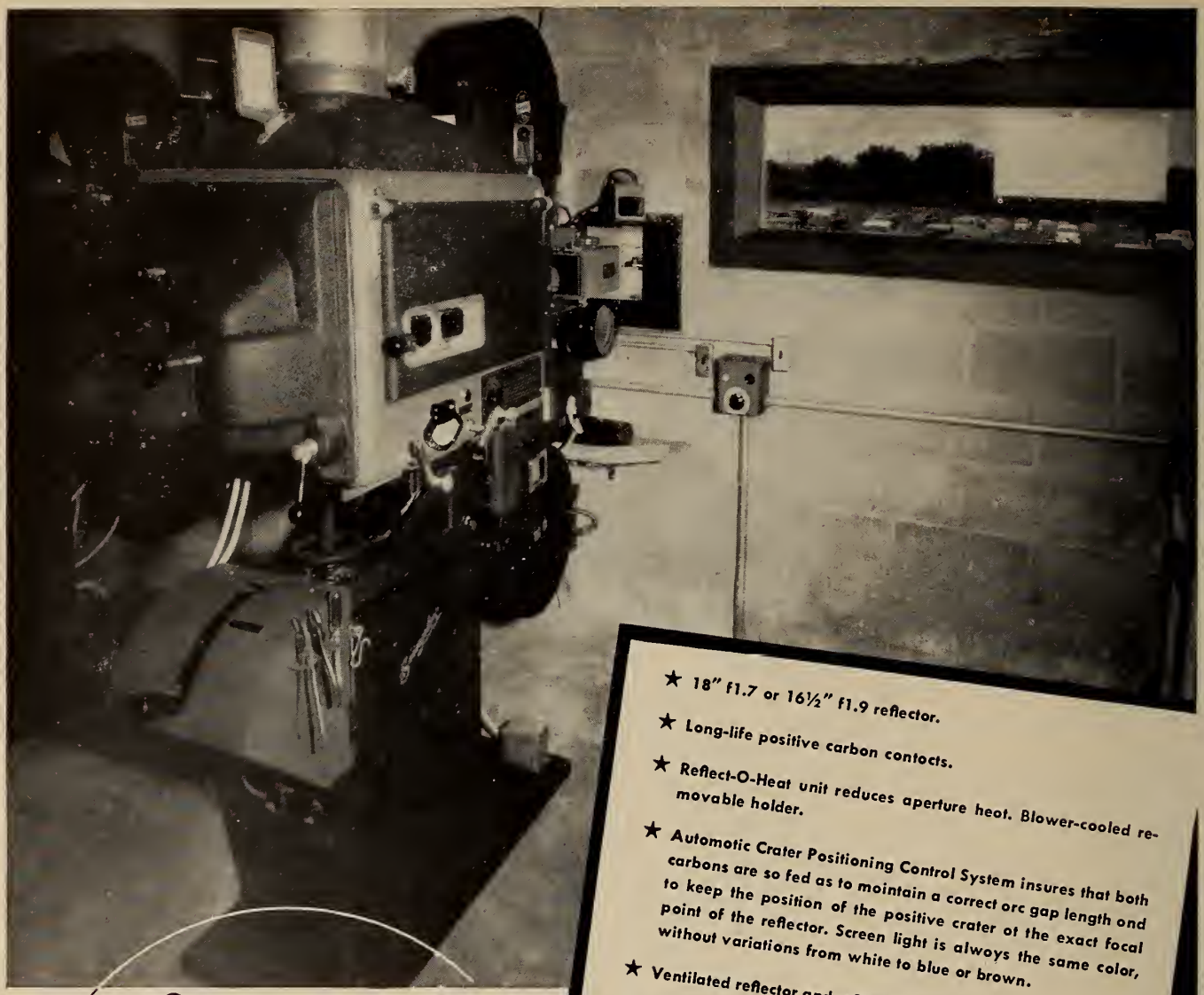
WITH THE HOLIDAY season here, it is an excellent time to take look backward over the events of the past year in the motion picture exhibition industry. Last January IP stated that 1954 was the year when the industry stopped bemoaning its forthcoming doom in the battle with the Tv interests. It became aware that the technological weapons it had put into use were attracting people back into theatres and renewing the health of the business. The continuing rapid growth of the drive-in section of the industry was also a great help. The year now closing, 1955, was one in which further gains were made, and one in which future patterns were apparent.

The important news this year was "roadshow" presentation of special expensively-budgeted films such as the Todd-AO production of "Oklahoma" and the double-frame VistaVision showings of "Strategic Air Command." 20th Century-Fox also entered the roadshow picture and will shortly arrange for presentation of 55-mm CinemaScope prints in some large theatres. The new projection equipment developed for these "roadshows" makes use of a film frame more than twice the normal 35-mm size plus stereosound reproduction of great range and fidelity. The results in realism and beauty of both picture and sound are such that the Tv boys can only stand aside and watch. The 35-mm prints of these "big" pictures will enable smaller theatres to profit.

The Combined Magnetic-Optical Print

A FEW MONTHS ago it was stated in this column that confusion among projectionists over the wide variety of release prints either being circulated or scheduled for circulation had reached a point where the whole industry was likely to be hurt. This month we can report that the film producers, working through the Motion Picture Research Council in the development of the combined magnetic-optical print, have taken a step which may relieve much of this confusion and also eliminate the shortage of CinemaScope prints. Often only magnetic prints have been available from exchanges, and a majority of theatres do not have the equipment to play them. An article in this issue of IP describes the magnetic-optical print and how its introduction will affect the projectionists. M-G-M has taken the lead by using the new print for a December release.

However, there are strong objections from 20th Century-Fox and also from many engineers within the film industry. They feel that the narrow optical track squeezed onto this print is not as efficient as the standard optical track long with us. They assert that the use of what they consider to be an inferior soundtrack will be a step backward that contradicts all the effort made during the past few years to improve sound. It is hoped by the many who oppose use of the narrow optical track that the effort by equipment manufacturers to make single-channel magnetic sound systems available at the lowest possible price will encourage many exhibitors to forsake optical sound reproduction of CinemaScope.



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VOLUME XXX DECEMBER 1955 NUMBER 12

Color and Its Reproduction on Film

By ROBERT A. MITCHELL

The tremendously important role which natural color now plays in the production of motion pictures makes this series of articles particularly timely. They describe the nature of color and various methods used to reproduce it in the film theatre.

COLOR is a mighty important aspect of present-day movie production. Even television is turning more and more to natural color. Now, nearly everyone knows what color is, but no one, not even Noah Webster, has succeeded in defining it satisfactorily. We can only describe color as a special kind of visual sensation caused by the predominance of certain wavelengths of light and the absence of others.

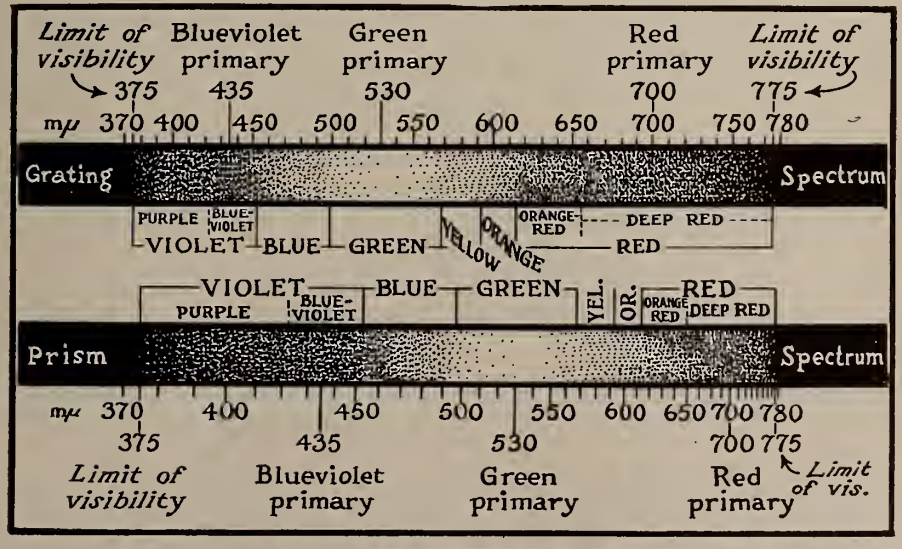


FIG. 1. The visible spectrum as praduced by a diffractian grating (above) and a glass prism (belaw). A grating spectrum is "normal," that is, equal differences in wavelength are separated by equal distances. In a prism spectrum the violet wavelengths are spread aut by greater dispersion, and the red wavelengths are much campressed. The mast easily discernible spectrum calors are violet, blue, green, and red. The narrow yellaw and arange bands between the green and the red are taa dulled ta be immediately apparent.

A narrow beam of white light, such as that from the sun or a carbon arc, can be broken up into a long band of brilliant colors, called a *spectrum*, by either a diffraction grating or a glass prism. Production of a spectrum by such means proves that ordinary white light is actually a mixture of colored rays, each ray having a specific wavelength.

The appearance of a spectrum depends upon whether a grating or a prism was used to produce it. In a prism spectrum, the longer wavelengths are squeezed together and the shorter wavelengths are spread out. A grating spectrum is "normal," that is, equal wavelength differences are separated by equal intervals along the spectrum (Fig. 1).

Four principal bands of color can at once be perceived in any complete spectrum: violet, blue, green, and red. The violet rays have the shortest wavelengths of all, and the red rays have the longest. The entire range of visible wavelengths is included between 370 and 780 millimicrons (mu). A millimicron is only 0.000000039 of an inch!

Close inspection of a spectrum re-

veals narrow bands of yellow and orange between the broad green and red bands. But because the brightest part of an equal-energy spectrum is the green region, the spectral yellows and oranges are so dull by comparison that their true color is not immediately apparent. A famous astronomer once complained that he could see no yellow in the spectrum.

It was discovered a long time ago that all the colors of the spectrum, and many more besides, can be matched by combining the light taken from three very carefully selected regions of the spectrum. The three fundamental spectral hues, called *primary colors*, are blueviolet (435 mu), green (530 mu), and red (700 mu).

This significant discovery led to an interesting explanation of human color perception. The eye has three "color receptors," each seeing only a portion of the spectrum. The blueviolet receptor sees all wavelengths from the violet end of the spectrum down through the blue to the middle of the green band. The green receptor perceives all wavelengths from the far end of the blue band down to the middle of the red band. The red receptor sees all wavelengths from the middle of the green band down to the red end of the spectrum.

The "ideal" visual response of the three color receptors of the human eye is plotted in Fig. 2. Note the curious "red hump" in the extreme violet region. The presence of this hump indicates that the shortest visible wavelengths stimulate the red receptor to a small degree as well as the blueviolet receptor. Red stimulation in this region accounts for the definitely purplish cast of the extreme violet.

Primary Color Sources

It is not necessary to use a spectroscope as a source of primary-color rays. Properly selected fluorescent lamps or glow tubes of the neon-sign variety may be used, or ordinary incandescent lamps fitted with narrow-band color filters to screen off all but the desired rays. Mercury-vapor tubes fitted with the proper filters are used as sources of monochromatic blueviolet (436 mu) and yellowish green light (546 mu). Primary green 530 mu) is unfortunately absent from the spectrum of the mercury-vapor lamp, but the 546-mu "line" is close enough for many purposes.

The production of colors by combining blueviolet, green, and red lights on a screen is called *additive color formation*. Illustrated by Fig. 3, this method is superior to all others for the accurate reproduction of desired colors. Observe that the combination of all three primaries in equivalent amounts produces pure white. The combination of only two primaries in equivalent intensities results in a *reciprocal hue*. Each of the three reciprocal hues (lemon, magenta, and cyan) is "complementary" to the primary hue absent from its composition. For this reason lemon is sometimes called "minus-blueviolet," magenta "minus-green," and cyan "minus-red."

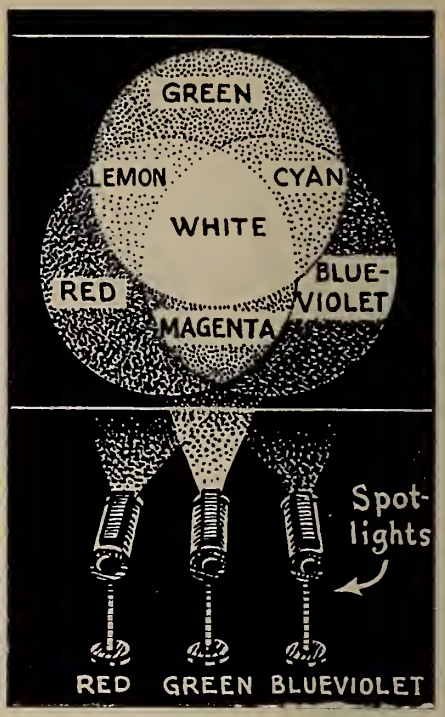


FIG. 3. Additive color formation. Blueviolet, green, and red lights may be combined to reproduce any desired color. Pure white is produced by combining the three "primary hues" in equivalent intensities. If three spots of B, G, and R light are thrown upon a screen, as in this picture, cyan (bright greenish blue) is produced where the green and blueviolet spots overlap, lemon (bright greenish yellow) where the green and red spots overlap, and magenta (dazzling purplish rose(where the red and blueviolet spots overlap. Magenta is called a "non-spectral purple" because it does not occur in the spectrum. Lemon, magenta, and cyan are the complementaries of the primary colors, and are known as the three "reciprocal hues." They are important in the printing of natural-color films.

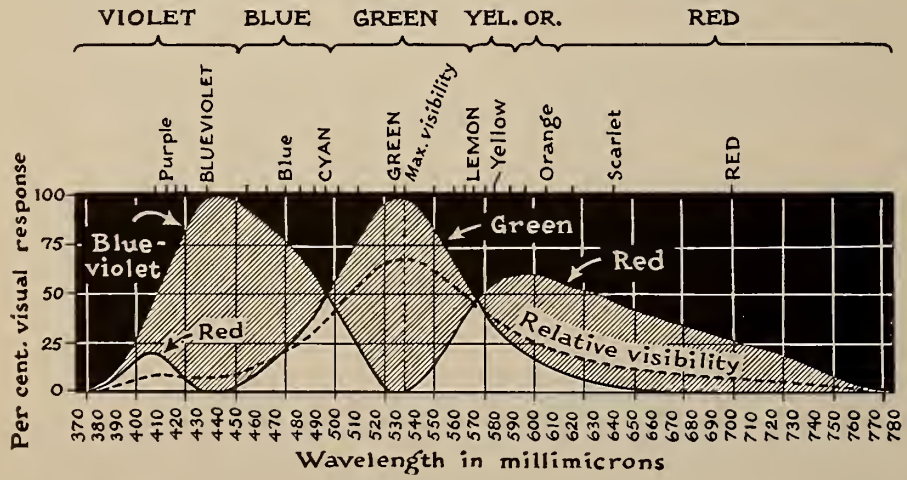


FIG. 2. "Ideal" normal response of the three color receptors of the human eye to the visible wavelengths of the equal-energy spectrum. The eye actually perceives only three colors, blueviolet, green, and red. Other spectrum colors are produced where the three main color regions overlap. The blues, for example, are mixtures of blueviolet and green, and the yellows and oranges are mixtures of green and red. The red receptor of the eye is stimulated, not only by red rays, but also to a small degree by the extreme violet rays. The shortest visible wavelengths, as a result, appear definitely purplish. The brightest part of the equal-energy spectrum (maximum visibility) lies in the yellow-green region very close to primary green. Being relatively less bright, the yellow portion of the spectrum has a dull olive color, and the orange region looks rather brownish.

Now, the composition of any color may be specified by a set of three numbers, one for each primary. The conventional order of the "indices" of a "trichromatic specification" is easy to remember because it is alphabetical — B, G, R.

On the basis of this new system, pure white is designated by 100-100-100. This color specification signifies an additive combination of blueviolet at 100 per cent intensity, green at 100%, and red at 100%. Black, the complete absence of light, is 0-0-0. A medium gray is expressed by 25-25-25, indicating that the B, G, and R components each has a relative value of 25% intensity. Flesh-tint is 40-50-80, purple is 100-0-20, medium brown



. . . as the shadows lengthened across the field, State threw into high the drive that's destined to linger long in football memory . . .

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is 0-5-15, jade-green is 40-100-40, etc.

The six fundamental hues — the three primaries and the three reciprocals — are so important in the technology of color motion pictures that descriptive data on them is especially interesting.

The Fundamental Hues

BLUEVIOLET, 100-0-0. Deep bluish violet at normal levels of illumination, intense blue at very high levels. Wavelength less than 440 mu, standard 435 mu. Relative brightness, 0.07 (white = 1). Complementary: lemon.

GREEN, 0-100-0. Bright rich green. Wavelength 530 mu. Relative brightness, 0.68. Complementary: magenta.

RED, 0-0-100. Intense deep red. Wavelength greater than 670 mu, standard 700 mu. Relative brightness, 0.25. Complementary: cyan.

LEMON, 0-100-100. Bright slightly greenish yellow. Wavelength, 570 mu. Relative brightness, 0.93. Complementary: blueviolet.

MAGENTA, 100-0-100. Dazzling purplish rose. No wavelength, does not occur in spectrum. Relative brightness, 0.32. Complementary: green.

CYAN, 100-100-0. Bright greenish blue. Wavelength, 495 mu. Relative brightness, 0.75. Complementary: red.

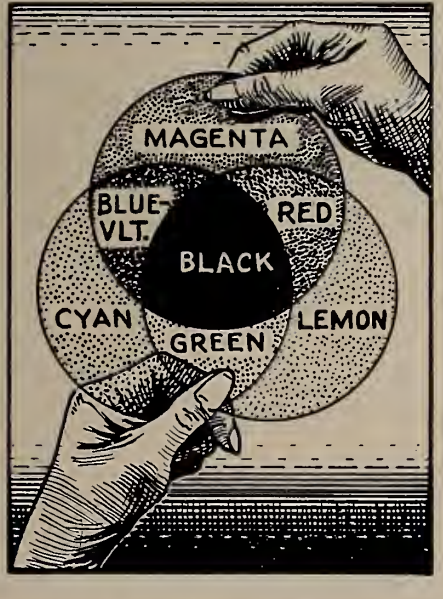


FIG. 4. Subtractive color formation. Three reciprocol-hue color filters ore placed together and overlopped in this picture. Where oll three overlop, no light can get through, hence the result is block. Where the mogenta and lemon filters overlap, red, a primary hue, is produced. (Magenta passes blueviolet and red, lemon posses green ond red. Becouse the mogenta filter blocks the green, and the leman filter blocks the blueviolet, only red rays can poss through both. In other words, green ond blueviolet ore subtracted from white light by the filter combination, leaving only red.) The other two primaries, green and blueviolet, are produced similarly by the reciprocal filters. The primary hues ore utilized in natural-color photogrophy.

Subtractive color formation involves combinations of the reciprocal hues in the form of pigmented materials, not colored lights. This process is utilized whenever paints, dyes, or other colored substances are mixed. It is best illustrated by the superposition of lemon, magenta, and cyan color filters in front of a white screen, as in Fig. 4. Observe that the combination of all three filters absorbs all light producing black. This is exactly the reverse of combining the three primaries on a screen to produce white.

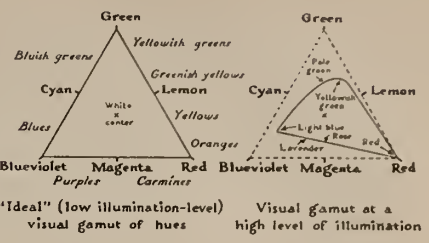
The subtractive combination of two reciprocal-hue filters results in the production of a primary hue. White light, so far as human color vision is concerned, ordinarily consists of three primary components, B, G, and R, in equal intensities. Each reciprocal filter absorbs one primary component and transmits two. But when two such filters are placed together, only that primary which is transmitted by each can pass through both filters. Of the two blocked primaries, one is absorbed by one reciprocal filter, and the other is absorbed by the other filter.

Confusion in Description

Painters and printers work with the reciprocals as "subtractive primaries," a rather confusing term that has led many people to assume wrongly that lemon, magenta, and cyan are primary colors. These hues are actually the complementaries of the primaries, blueviolet, green, and red. Further confusion has resulted from the common practice of calling lemon "process yellow," magenta "process red," and cyan "process blue."

Human color vision is additive, not subtractive, in its functioning. An orange object, for example, absorbs all of the blueviolet component of white light and about ¾ of the green, thus reflecting to our eyes about ¼ of the green and all of the red component. The additive combination of green at 25% relative intensity and red at 100% is orange (0-25-100).

The complementary of any color can be determined by subtracting its trichromatic specification from 100-100-100 (white). Standard medium blue, for example, has the specification



"Ideal" (low illumination-level) visual gamut of hues

Visual gamut at a high level of illumination

FIG. 5. It is often convenient to specify color mixture by means of a triangular diagram, the three corners of which are marked by the three primaries. The three reciprocals then occur at the midpoints of the three sides of the triangle. Hueless white, a mixture of all three primaries in equivalent intensities, occurs at the exact center. The "chromoticity triangle" holds for color mixtures only when the colors are observed at low levels of illumination by an ideal observer. When light level is increased, the blueviolet primary looks brighter and bluer (less violet), and the green primary looks yellower and paler.

100-30-0. Its complementary, therefore, is:

```
100 - 100 - 100 White
 —   —   —
100 -  30 -   0 Medium blue
-------------
  0 -  70 - 100 Rich yellow
```

Any pair of complementary colors (e.g. blue and deep yellow) combine additively, as when projected upon a screen, to form pure white.

```
100 -  30 -   0 Medium blue
 +   +   +
  0 -  70 - 100 Rich yellow
-------------
100 - 100 - 100 White
```

Subtractive combinations of complementary pairs by combining color filters, on the other hand, results in black in only three cases — the three primary-reciprocal pairs. In *subtractive* color-forming calculations, corresponding indices are multiplied, *not* subtracted.

```
  0 -   0 - 100 Red
  ×   ×   ×
100 - 100 -   0 Cyan
-------------
  0 -   0 -   0 Black
```

The subtractive process gives a low value of a primary color, not black, in the case of all other complementary pairs of hues.

```
100 -  30 -   0 Medium blue
  ×   ×   ×
  0 -  70 - 100 Rich yellow
-------------
  0 -  21 -   0 Dark green*
```

A special type of subtractive color-

*The number 21 for the resultant green index is obtained by multiplying 30 by 70%, or 0.70.

forming process occurs when paints and similar pigmented materials are mixed. Called "reversed color addition," the calculation is a bit complex, and may be dismissed with the practical observation that neither black nor neutral gray can be obtained by mixing paints of complementary colors unless the pair be one of the three primary-reciprocal pairs (blueviolet & lemon, green & magenta, red & cyan).

Human Range of Vision

The trichromatic theory of human color vision accounts for all the observed facts, and is probably true even though biologists have yet to discover three separate color receptors in the optic nerves and cones. The three response curves plotted in Fig. 2, however, are "ideal," and are approximated in actual color viewing only when the spectrum is observed at low levels of illumination.

At high light levels each receptor is stimulated to some extent by all three primaries. The three curves in Fig. 2 then spread out at the base of the chart, the blueviolet and red curves actually overlapping in the green region. The green of an excessively bright spectrum accordingly looks yellower and paler than normal. Spreading of the green "toe" into the blueviolet region causes the violet to become bluer and, at the extreme violet

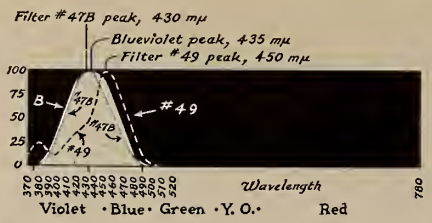


FIG. 7. The clear white area in this spectrogram shows the transmission curve of an ideal blueviolet filter. A filter having these characteristics passes blueviolet light and blocks green and red light. The solid line reveals the transmission characteristics of a certain very good commercial color filter. Note how closely it follows the ideal curve. The broken line indicates the transmission of a less satisfactory gelatin filter.

end of the spectrum where we find the "red hump," rather grayish — a sort of silvery lavender-blue. The greenish blues become definitely whitened under high brightness-level conditions of viewing.

The gamut of hues and their chromatic intensity, or "saturation," may be plotted on an equilateral triangle, the corners of which represent the pure primary hues. The "chromaticity triangle," of which more will be said later in connection with color photography and picture reproduction, is shown in Fig. 5. Note that a line drawn between any two colors complementary to each other passes through the center of the triangle — the "white," or "hueless," center.

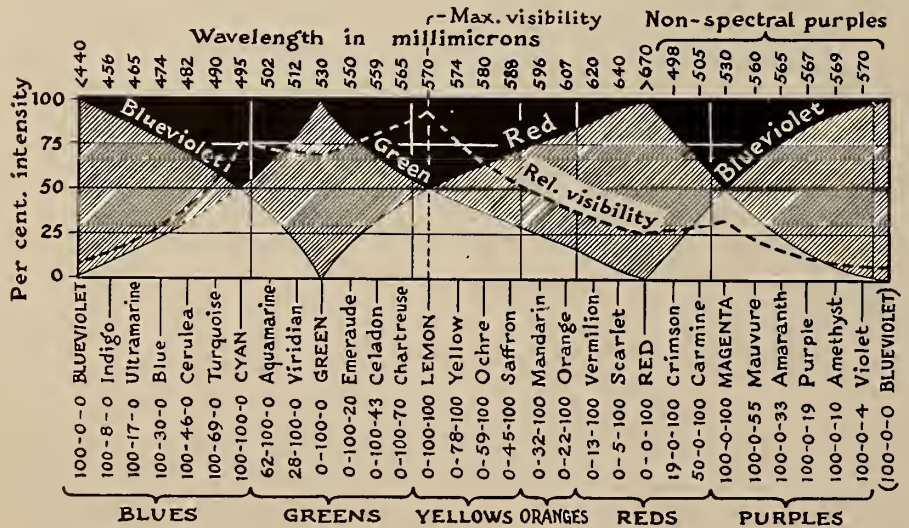


FIG. 6. Reproduction of the full gamut or range of hues by additive combination of blueviolet, green, and red illuminants. The thirty hues are listed in approximately equal sensation-difference steps along the bottom of the chart. The color-specification numbers refer to the relative intensities of the primary components in this order: B, G, R. The non-spectral purples are composed of blueviolet and red, and are assigned the wavelengths of their complementary blue-greens, greens, and yellow-greens. The curves in this chart look very different from the eye-sensitivity curves in the spectrum chart (Fig. 2). While the brightest wavelength in the equal-energy spectrum is 535 millimicrons and has the specification 0-100-1 (almost indistinguishable from primary green), the brightest hue made by additive mixture of the primaries is lemon (0-100-100), a bright greenish yellow which matches the spectrum wavelength 570 millimicrons.

At high light levels, however, the chromaticity triangle degenerates into the lop-sided curve shown at the right in Fig. 5. It can be seen that all hues except primary red (the most intense red imaginable) have lost saturation, or become washed out, by leaving the sides of the original triangle and working in toward the hueless center.

Limitations of System

The *degenerated* triangle reveals a sad fact. It is impossible to match, by means of primary-light combinations, all the hues of the spectrum at excessively high levels of illumination! There is no definite point at the top of the degenerated triangle where primary green may be located. This is

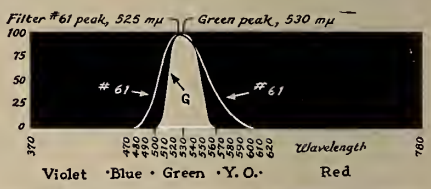


FIG. 8. An ideal primary-green filter transmits only a narrow band in the green region. The solid line shows the transmission characteristics of a good green gelatin filter. Although it "peaks" properly, the commercial filter transmits too much of the blue, and especially of the yellow wavelengths, to be entirely satisfactory in such exacting applications as comparison colorimetry and the copying of color motion-picture films.

because excessively bright green light stimulates, not only the green receptor of the eye, but also to some extent the blueviolet and red receptors. Primary green then virtually "contains" more red than do the blues of the spectrum even at the highest light levels, hence the pure spectral blues cannot then be precisely duplicated by mixing green and blueviolet on a screen.

This defect of the trichromatic system of both additive and subtractive color formation, although a nuisance in the scientific measurement of color, is not sufficiently serious to annoy color-photography technologists.

Industry Practice

To standardize and simplify working procedures, many color engineers today use the ideal, or non-degenerated, chromaticity triangle as a basis for color determination in place of the older "standard observer" tables and other complicated and arbitrary colorimetric standards established by scientific organizations many years ago.

If we ignore the saturation-destroy-

(Continued on page 42)

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and thereby reestablishing the motion
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the world of entertainment.

There's No Business Like Show Business!

The Combined Magnetic-Optical Print: A Compromise to End Confusion

By JAMES MORRIS

Despite complaints that this move is a step backward, M-G-M releases combined print to end bottleneck created by the refusal of many exhibitors to install magnetic sound equipment.

AFTER a lengthy period of struggle, it seemed likely this month that a permanent, or at least a semi-permanent, compromise is about to be reached in the battle of the soundheads. On the 23rd of December, M-G-M is releasing a film called "Kismet," the prints of which will carry both magnetic and optical soundtracks so that a single print may be played in any theatre regardless of what type of sound reproduction equipment the theatre possesses.

Although there are many valid objections to this type of print, raised both by 20th-Century-Fox and many reputable sound engineers, it must be admitted that the magnetic-optical print goes a long way toward solving one of the industry's most vexing problems—the confusion arising from the existence of a variety of release prints requiring different projection room equipment. The biggest drawback in the eyes of its opponents is that the optical track on this print is considered to compromise sound quality. Greater realism in both picture and sound was the elusive goal sought after by the men who revolutionized the whole technique of exhibition a few years ago.

Many Studios Joined

A number of studios in addition to M-G-M participated in the design of the magnetic-optical print although these studios have not as yet begun to produce them in their laboratories. They include Columbia, Universal and Warner Brothers. All of these producing interests felt that the cost of continually producing two different types of CinemaScope prints—magnetic for some theatres and optical for others —was too much to bear.

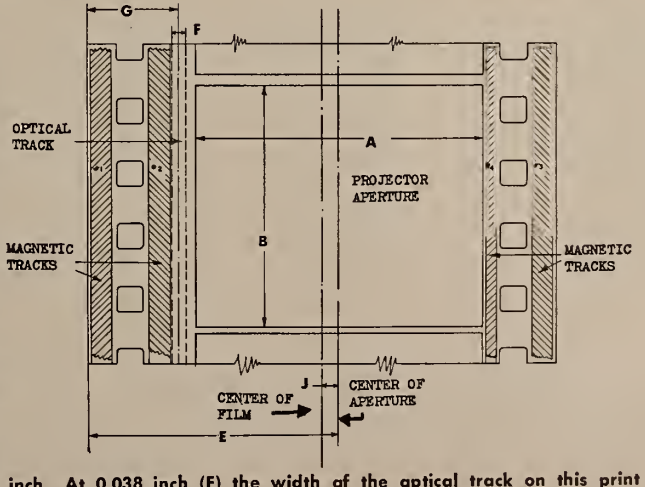
In addition, these companies have been complaining loudly for some time that distributing both magnetic and optical prints created distribution problems that were almost impossible to solve in practice. All theatres cannot use magnetic prints, and those requiring the optical type are often required to wait for playing time while magnetic prints lay unused at exchanges.

20th Century-Fox, on the other hand, has been strongly opposed to the whole idea of the combined print, and has stated repeatedly that the only progressive solution for the confusion resulting from the distribution of two types of prints would be for all theatres to install some form of magnetic sound. If a theatre is too small or not ready for a full magnetic stereosound system, Spyros Skouras, president of Fox, told exhibitors assembled at the recent Allied States convention in Chicago, the thing to do is to purchase sufficient magnetic reproduction equipment to play one magnetic track over the theatre's existing amplifier and speaker. The necessary equipment, he told the exhibitors, costs less than $900 and is now available from all manufacturers of theatre sound equipment.

Picture Size Reduced

Another objection by 20th Century-Fox concerning the magnetic-optical print is that the extra space required to hold the optical sound track cuts into the size of the CinemaScope picture, reducing the width from an aspect ratio of 2.55 to 1 down to about 2.35 to 1. M-G-M executives consider this an impractical outlook, remarking that most theatres using CinemaScope magnetic prints have to mask down their apertures anyway because the physical limitations of their prosceniums and auditoriums make it impossible to show 'Scope pictures in the full 2.55 to 1 ratio. In addition, it is pointed out that optical-sound CinemaScope prints have a 2.35 to 1 aspect ratio anyway. The new magnetic-optical print has the same dimensions and requires no change in lenses.

The Fox stand on the sound question is supported by many engineers within the industry. They feel that the introduction of magnetic stereophonic sound was an important and necessary step forward, and that en-



The position and size af the picture aperture and the narrow optical saundtrack of the cambined magnetic-optical print is shown in the above diagram prepared by the Motian Picture Research Council. Shaded areas indicate the position of the faur magnetic soundtracks. Dimensian A is 0.839 inch maximum; B is 0.715 inch maximum; E is 0.738 inch plus ar minus 0.002 inch; F is 0.038 inch maximum; G is 0.262 inch plus ar minus 0.002 inch, and J is 0.049 inch. At 0.038 inch (F) the width af the aptical track on this print is less than half the 0.084 inch width af the standard optical track.

couraging exhibitors not only to retain their old optical sound reproducing setups, but also giving them a more narrow, less efficient optical soundtrack, squeezed onto a 35-mm print that already carries four magnetic soundtracks, is a step backward. They point out that the optical track on the new combined print will give less satisfactory results than the standard optical soundtrack which the industry is trying to replace.

M-G-M technical spokesmen deny this. They admit that there is a slight unfavorable change on the signal-to-noise ratio of the narrower optical track, but they claim that this can be effectively compensated for by increasing the fader setting in the projection room by 4 to 6 decibels. They also state that there is no decrease in sound frequency range when the narrow optical track is used compared with the wider standard variety. They add, however, that they consider magnetic sound superior to any form of optical reproduction now available.

Paramount Studios, it is interesting to note, is the only large studio not affected by the introduction of the magnetic-optical print. Since it has stubbornly refused to go along either with the CinemaScope or magnetic sound ideas, its prints can be run in any projector, with or without changes.

Advantage Is Economic

It is understood that the chief reason for developing the combined magnetic-optical print was an economic one. It was designed to solve distribution problems and to cut costs. It should not be assumed, however, that this print will solve all reproduction problems without any changes in a theatre's projection setup, or without any extra precautions on the part of the projectionists.

As described in last month's issue of IP, the new print utilizes the narrow "Foxhole" type of sprocket hole needed to conserve space on CinemaScope magnetic sound prints. In order to exhibit this print, an optical sound theatre must install new projector sprockets to conform to the dimensions of the CinemaScope perforations. It must also "degauss" or demagnetize its projection and rewind equipment so that the magnetic tracks on the print will not be damaged while in the theatre.

The Altec Service Co. has issued a special bulletin to its nationwide staff dealing with these problems. While stressing the moderate expense of the changes needed (new projector sprockets might cost from $75 to $100), Altec suggests the following procedure:

1. Careful alignment of the sound slit in the optical soundhead because of the reduction in soundtrack width.

2. Special attention to demagnetization in houses where only optical sound is used to eliminate the possibility of the magnetic tracks picking up extraneous noise as the film leaves the upper magazine, passes through the projector head, and travels through the optical head to the lower magazine. Failure to follow this procedure may cause trouble with a perfect print if it is intended for further use in magnetic reproduction.

3. The installation of new "Foxhole" CinemaScope sprockets in both projector and soundhead.

Altec also pointed out the possibility of an increase in signal-to-noise

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NATIONAL DIRECTOR OF EXHIBITION FOR CINERAMA

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ratio because of the reduction in the width of the optical soundtrack.

To Magnetic Houses First

It should be mentioned here that M-G-M, and presumably the other producing companies which will use the magnetic-optical print, are aware of the danger of damage to these prints if they are distributed to theatres accustomed only to optical sound reproduction. The plan is to distribute them to magnetic-equipped houses for first runs. It is felt that this plan will work out because it is believed that just about all first-run theatres are equipped to handle magnetic sound.

A number of producing companies in addition to M-G-M participated in the design of the magnetic-optical print. The experimental work was carried out by the Motion Picture Research Council in Hollywood. The original plan had been to devise a means of wiping off the magnetic stripings on CinemaScope prints after all theatres equipped for their use had run the film. An optical track which existed all along beneath the magnetic striping would have then been used by the smaller theatres. This idea didn't work out, and a print on which a narrow optical track was placed beside the number 2 magnetic track was designed instead.

Three courses are open to any theatre in deciding what type of sound reproduction is desired from the combined magnetic-optical print provided the required equipment is available at the theatre. Reproduction from all of the three stereophonic magnetic tracks, plus the track for surround effects, can be obtained exactly as heretofore. Reproduction of only the number 2 magnetic track is suggested by 20th Century-Fox and many sound engineers as the next best expedient. Equipment to accomplish this can be purchased from most theatre equipment dealers for less than $900. . Less desirable from the standpoint of sound quality, but also least expensive, is the course of reproducing the narrow optical track. The projector sprockets necessary for using film with CinemaScope perforations can be purchased for $100 or less.

The second course, that of using single-channel magnetic sound, will be interesting to projectionists at many small theatres because it offers an opportunity to provide patrons with high quality sound at low cost. Typical of the single-channel magnetic sound systems now available are the Simplex units distributed by National Theatre Supply. A description follows:

Priced to sell at less than $900, the Simplex XL101 single-track magnetic sound system utilizes the same components found in the largest Simplex full stereophonic system. Magnetic soundheads are equipped with standard multi-track plug-in pick-up heads, even though only the number 2 track is reproduced. The soundhead fits any standard projector mechanism and accommodates all standard upper magazines.

Two plug-in pre-amplifiers come as standard equipment with this sound system. They are mounted in a small wall-type cabinet and are instantly interchangeable or replaceable. Use of 2 pre-amplifiers permits individual sound level balance from both soundheads.

The power supply is housed in a ventilated wall cabinet designed to increase the life of the unit and cut down tube replacement. It is self-regulating and equipped with selenium rectifiers and dual rectifier tubes for continuous operation. Constant load level is automatically maintained.

Sound changeover is made by means of push button control. Changeover cabinets are mounted on the front wall at each projector location and a bullseye "ON" light indicates the projector in use. This method of changeover is adaptable to any number of projectors.

The Simplex single-track magnetic system is designed to provide for greatest possible economy, while at the same time permitting the use of standard components that are not replaced or discarded should the system be expanded to full stereophonic sound at a later date.

In conclusion it should be emphasized that the magnetic-optical print was developed, not because it offers any improvement in theatre sound quality, but because a majority of the nation's exhibitors were unwilling to install magnetic sound in their theatres. It is a compromise to reduce confusion in the industry.

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Season's Greetings

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RCA Reproduces Pictures by Magnetic Tape System

New equipment, now being field tested, may alter Tv methods through low-cost recording and reproduction of pictures and sound on magnetic tape.



An RCA engineer examines complicated magnetic reproduction equipment at New York City's NBC studios. This still experimental reproducer transmits color Tv picture signals, eliminating the need for an actual picture on film.

AN INTRICATE electronic system for recording color and black-and-white pictures on magnetic tape for Tv use is now being field tested by the NBC studios in New York City.

The system was developed by RCA and was first publicly demonstrated on Dec. 1, 1953 at the RCA Research Center, Princeton, N. J. A full report of the demonstration was carried in IP's Dec. issue of that year. Today, exactly two years later, laboratory refinements have improved the system almost to the point where it may soon be put to general commercial use.

When the time comes that it is actually put on the market, "electronic photography" as it is referred to by the originators, will probably revolutionize the entire motion picture and television industry. The new system is nothing more, nor less, than the recording of sound *and* picture on a special magnetic tape that can be stored, replayed immediately without processing. or "erased" and used again.

Widespread Use Foreseen

Though the field testing now being conducted by NBC is strictly for television purposes, the same principles may some day apply to the recording and exhibiting of motion pictures for theatres. In addition to television and motion picture use, the new type tape recorder is adaptable to home entertainment, education, and industry in general. Television tape recorder units are certain to be developed in the future. These will enable a Tv set owner to accumulate a library of favorite television programs which can be seen whenever desired, in the same way that a library of phonograph records now makes it possible to hear favorite records at will.

Following the 1953 demonstration, an improved television tape recorder was developed by RCA and then installed in the NBC studios for field testing. Earlier this year, a color television program using the new equipment was transmitted over commercial Tv net work facilities for the first time. The telecast, complete on magnetic tape, was sent via closed circuit from New York to St. Paul, Minn., as part of the dedication ceremonies of the new research center of the Minnesota Mining and Mfg. Co. Minnesota Mining is the manufacturer of the new magnetic tape.

The entire program was recorded in advance on the developmental video tape system at the NBC studios, and the tape was stored until scheduled transmission time. The telecast was received by St. Paul over the microwave relay facilities used for NBC commercial network programs.

How System Operates

The Tv magnetic recorder is similar in its basic principles to the conventional tape recorders used today for sound alone. Electrical signals — broadcast video and audio signals of television — are impressed through a recording head onto the magnetically treated surface of the plastic tape. As the tape is drawn across the recording head, the head continuously changes the magnetic polarity of the magnetic particles on the tape so that they become a compact code of the original signal. This pattern remains indefinitely on the tape during subsequent playbacks, until it is desired to "erase" the signals electronically and use the tape again to receive another set of signals.

For playback, the tape is drawn across the same head or a similar one. The magnetic code on the tape causes an alternating current to flow in the windings around the reproducing head, creating a duplicate of the original signal.

One of the chief differences between sound tape recording and Tv tape recording is the volume of signals each carries. While sound tape recorders must accommodate signals in a frequency range of up to 20,000 cycles per second, the video signals of black-and-white television extend up to 4,000,000 cycles per second. With the addition of color, at least

(Continued on page 42)

Season's Greetings

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Portable Arclamp Equipment For 16-mm Projection†

Arclamps make it possible to use greatly enlarged screens for 16-mm shows, and also permit projection in rooms that cannot be entirely darkened. Various lamps and associated rectifying units are described in the following article.

By ROBERT S. FREEMAN
Strong Electric Corp., Toledo, Ohio

WITH the use of 16-mm projection equipment for the showing of motion pictures to large audiences, the need for increased light is becoming more apparent.

That it is possible to show 16-mm pictures to a large audience was demonstrated by the premiere of a new educational film in Madison Square Garden in New York City. A full color film was projected more than 250 feet onto a screen 32 feet wide in the main arena of the Garden.

When the size of the audience exceeds 200 people a screen larger than 8 or 9 feet wide should be used. An incandescent lamp will not furnish enough light for this size of screen and an arc lamp should be used.

1600 Lumens Obtainable

Portable 16-mm 30-amp arc projectors are capable of projecting 1600 lumens onto the screen using a two-interruption shutter with approximately 70% center-to-side screen distribution. This is approximately five times the amount of light obtained with a 1000-watt incandescent lamp.

† Journal of the SMPTE, June 1955.



Fig. 1. 30-amp reflector-type orclomp used on the Amproorc 20, GPL PB 101, ond Holmes Nuorc, Rexorc, ond television reor projector.

An arclamp which projects 1600 lumens on the screen will allow a picture 15 feet wide to be used on a matte-surface screen and provide 9 Foot-Lamberts when measured at the center. A 15-foot wide screen is large enough for an audience of approximately 575 people.

The larger semiportable 16-mm 46-amp arc projectors are capable of producing 2500 lumens on the screen, with the shutter running. With 2500 lumens available a picture 18½ feet wide can be used with a brightness of 9 Foot-Lamberts on a matte-surface screen. This is large enough for an audience of over 1000 people.

Basically there are three carbon arcs which are used for 16-mm projection. These are the 10-amp, 30-amp, and the 46-amp arcs.

Types of Portable Arclamp

PORTABLE 10-AMP AND 30-AMP ARCS: The 10-amp arc is a relatively new carbon-arc trim available on the RCA Porto-Arc projector when special feed and take-up facilities are provided. The carbons used are a 6.4-mm carbon for the positive and a 5-mm carbon for the negative. These carbons will allow a continuous showing of a 4000-foot reel of film which takes approximately 2¼ hours.

The 10-amp trim will project 850 lumens on the screen at 70% center-to-side screen distribution using a two-interruption shutter. This is over twice the amount of light obtained with a 1000-watt incandescent bulb.

The power supply which is used with this carbon trim provides 10 amps DC at 50 volts. Two 6-amp gas-filled rectifier tubes are used. Primary tap switches are provided for varying line voltages.

The 30-amp 28-volt DC arc uses a 6-mm x 8½ inch positive carbon and a 5½-mm x 6 inch negative carbon. These carbons are sold under the National Carbon Co. trade name of Pearlex. With the lamp operating at rated voltage and current, the burning rates of the carbons are 6¼ in./hr for the positive carbon and 3⅝ in./hr for the negative carbon. This will allow the continuous showing of a 2000-foot reel which takes approximately 1 hour.

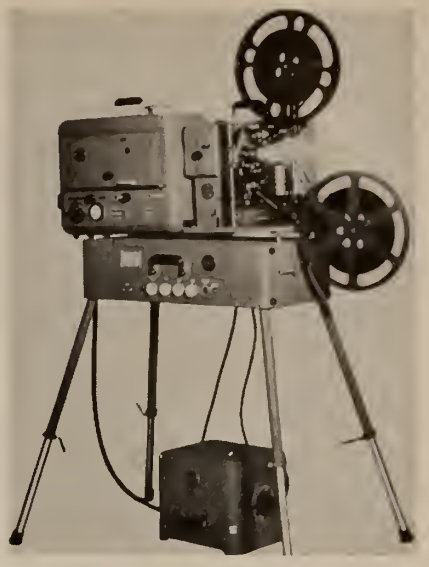


Fig. 2. Reflector-condenser type orclomp os used on the RCA Porto-Arc projector.

Reflectors, Condensers

There are two types of lamphouses used with the 10- and 30-amp arcs. They are the reflector type and the reflector-condenser type. Figures 1 and 2 show these lamphouses.

The reflector type of arclamp is used on the Amproarc 20 projector, the General Precision Laboratory Model PB101 projector, and on the Holmes Nuarc, Rexarc and Television Rear Projector.

This arclamp uses an elliptical reflector 10¼ inches in diameter with a geometric focus of 4 inches. The working distance of the reflector is 16 inches from the film aperture which results in an optical speed of *f*/1.6. This matches the *f*/1.6 lens commonly used in 16-mm projectors.

The reflector-condenser type of arc lamp is used on the RCA Porto-Arc projector and on the Victor 1600 projector. This arc lamp uses an elliptical reflector 7½ inches in diameter at a working distance of from 24 to 25 inches. The condenser lens is mounted 13 inches from the reflector and the combination of the reflector

and condenser lens results in a working distance of less than 17 inches. This will give an optical speed of approximately *f*/1.6.

Some of the features which can be found on the lamphouses for portable projectors are horizontal and vertical adjustments for the reflector, focus adjustments for the reflector, adjustable-speed motor for carbon feed, arc imager and an ammeter to read the arc current.

All the projectors require heat filters or aperture cooling when black-and-white film is used unless it is of a rather low density. Usually the heat filter is not required when showing color film. At silent speed (16 frames/sec) the heat filter is required for all film.

30-Amp Power Supply

Power supplies for the 30-amp arc are two-tube, gas-filled, full-wave rectifiers. They operate off a 115-volt line and have line adjustment taps for voltage variations. The AC load does not exceed the 15-amp limit provided for by most 115-volt convenience outlets. AC volt-meters are provided on the rectifiers to check the line voltage. All the lamp-houses have an interlock switch which operates a contactor to remove power from the arc whenever the lamphouse door is opened.

SEMIPORTABLE 46-AMP ARCS: A 46-amp 33-volt DC arc lamp is used on the General Precision Laboratory Model PB102 projector and on the Eastman Model 25 projector. These projectors are semiportable. However, they are extensively used where a permanent installation is desired. Figures 3 and 4 show these lamps mounted on projectors.

The carbon trims used in these lamps are a 7-mm x 12-inch Suprex positive carbon and a 6-mm x 9-inch Orotip C negative carbon. These carbons will give a full 80 minutes of burn at 44 to 46 amp and 33 volts DC.

The reflector used in the lamp is 11⅜ inches in diameter with a geometric focus at 4 inches and a working distance at 30 inches.

The lamp used on the GPL Model PB102 projector has a plano-convex lens of approximately 15-inches focal length placed 3⅝ inches from the film aperture. This allows the reflector to work at 25½ inches with a beam speed at the aperture of *f*/1.6. The plano-convex lens acts also as a heat filter. In addition to the heat filter the GPL Model PB102 uses a pulsed air blast on the film aperture to cool the film and reduce film buckle.

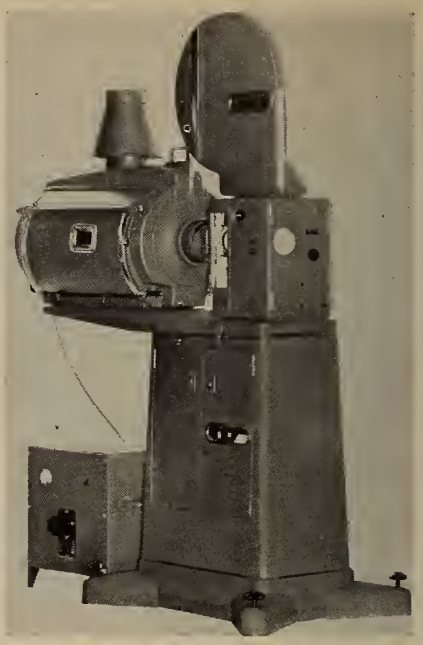


Fig. 3. 46-amp arclamp used on GPL model PB 102.

A condenser-lens system is also used with the Eastman lamp. The condenser lens which is used on the projector with a tungsten lamp, is replaced by a condenser lens of 44-mm (1.73 inches) diameter designed for use with the arc lamp. A heat filter 5 inches in diameter is mounted directly in front of the lamphouse. The heat filter is required for black-and-white film but is not required for color film. To reduce film buckle a curved gate of 3-inch radius is used. This slight curvature of the film gives it strength to withstand the distorting forces produced by the heat on the film.

The 46-amp arclamp is capable of supplying 2000 to 2500 lumens on the screen depending upon whether or not a heat filter is used.

The rectifier for this lamp is a 230-volt, 4-tube Tungar rectifier. The current drawn on the primary side of the transformer at rated output voltage and current is 13 amps. Power to the arc may be adjusted by an 8-position rotary-dial switch. An interlock switch is provided on the lamphouse door which operates a mercury relay to control the AC power input

(Continued on page 41)

☆

Season's Greetings

to the thousands of craftsmen whom we have been privileged to serve with fine cinematic equipment.

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1945 to 1955: Ten Years of Progress In Projection Technology

In addition to widely-heralded developments in wide-screen projection, stereophonic sound and slow-burning triacetate film, the last ten years have seen a number of little-publicized but important improvements in projection methods.

THE PAST ten years have witnessed a number of important developments in 35-mm film projection, and also in the complicated photographic and electrical processes that go into producing a finished motion picture release print. A few of these developments, such as 3-D and CinemaScope, are immediately recognized by the moviegoing public, hence possess direct box-office value.

Other innovations, such as the reduction of ground noise by magnetic recording, the reduction of negative-emulsion grain by the VistaVision process, and the improvement of image resolution in color prints by the use of multilayer dye-coupler color positives, are holding satisfaction with theatre motion pictures at high levels by virtue of their influence on visual and sound *quality*.

Another important development, the substitution of safety film for the dangerous nitrate film of yesteryear, is of greater significance to projectionists than to the general public. The average projectionist has never had a film fire in his projection room, but he knows of cases where brother projectionists have been seriously injured, or even killed, by accidents with nitrate film.

All theatre-release prints were made on nitrate-base stock until 1946, when triacetate safety base began to be produced on a large scale. The fireproof construction of projection rooms and projection equipment is a sufficient reminder of the days when movie projection was classed among the more hazardous occupations. Projectors and projection rooms are still equipped with such safety devices as were considered necessary for nitrate-film projection.

Unfortunately, the use of nitrate prints has never been outlawed. For this reason, every possible safeguard against film fire still must be installed and kept in good working order. Sooner or later, however, nitrate prints will be a thing of the past, and the projectionist will find himself less likely to be injured by fire than any other theatrical employee.

Safety Film Advantages

The prevalent belief that triacetate safety film presents a fire hazard, albeit a small one, is wrong. Safety film is technically "slow-burning" insofar as it is physically possible to ignite a strip of it and keep it burning by guarding the feeble flame against drafts which would extinguish it. But to maintain the combustion of a large roll of safety film is extremely difficult without some other source of flame.

To burn up a reel of triacetate film in the closed magazine of a projector is presumably impossible. The writer does not know of a single case where anybody, by design or otherwise, has succeeded in burning more than a couple of inches of safety film in a motion-picture projector.

When the first theatre releases on triacetate-base film appeared, many projectionists were made aware of the difference in film stock by the failure of film splices to hold together. This was especially true when "sneak tests" of the new safety film were conducted in 1946. Alternate reels of certain feature films were printed on the new safety film, and no one took the trouble to tell the projectionist that his regular cement was unsuitable for splicing the new stock. A few "shorts" were also issued on safety-base stock in 1946. These sent wise projectionists hurrying to the nearest drug store for glacial acetic acid, a corrosive and pungent liquid capable of joining triacetate film, especially when a little chloroform was added.

In 1947 came the first regular safety-film releases in the form of Republic's "duplitized" (double-coated) Trucolor productions. The new safety-film prints arrived at theatres unaccompanied by either adequate film cements or instructions for splicing. In the meantime, however, manufacturers of film cements were quietly switching over to different splicing ingredients, but that was no help to projectionists who possessed large quantities of nitrate-film cement. The use of an unfamiliar type of film base was bad enough, and the double-coated color film only made matters worse.

This was the severest test to which the new safety film could have been subjected; surprisingly, it emerged victorious. Examination of used Trucolor prints by film technologists revealed that the new safety base did not become brittle or shrink like nitrate film, and that it withstood wear and tear remarkably well.

New Film Cements Necessary

Years of experience with nitrate film have accustomed projectionists to strong splices quickly made. Nitrate base is readily attacked by a large number of rather common organic solvents which may be used either singly or in combination in film-joining fluids. Nearly all of the commercial nitrate-film cements contained a large proportion of acetone; most contained small amounts of amyl acetate (banana oil), ethyl acetate, or some similar compound; the cheaper cements were composed mainly of alcohol and ether, ingredients which work well only in combination, and all were thickened to the viscosity of thin

MELE KALIKIMAKA
(MERRY CHRISTMAS)
HAUOLI MAKAHIKI HOU
(HAPPY NEW YEAR)
LOCAL 665 HONOLULU • HAWAII

syrup by dissolved nitrate base or celluloid.

Note that nitrate cements were composed of inexpensive and relatively nonpoisonous ingredients. Their "setting" action was swift, seldom requiring more than 4 or 5 seconds for a perfect splice. Triacetate safety-film base, on the other hand, is resistant to the action of the common nitrate-base solvents. Safety film may be spliced with glacial acetic acid to which a small amount of chloroform has been added, but this pungent mixture is so corrosive to the metal parts of splicing blocks that it is intensely disliked by projectionists.

The best solvent for triacetate base which is not too poisonous to be used in the projection room is a colorless liquid of faint, ethereal odor known as "dioxane." All good safety-film cements contain 50% or more dioxane by volume, the remainder being methyl acetate, acetone, alcohol, or some compatible solvent. Solvents such as methylene chloride, ethylene chloride, and especially tetrachloroethane, are too toxic to be used with safety in film cements.

It is noteworthy that the effective triacetate-film cements—the ones containing 50% or more of dioxane, and no chloroform, which does not dissolve nitrate base—are also satisfactory for splicing the older kinds of safety film and nitrate film. Such cements are accordingly "all-purpose" cements, and are recommended for all types of motion-picture film, excepting certain non-cellulose films now being tested in theatres but not yet in general use.

Focusing Difficulties

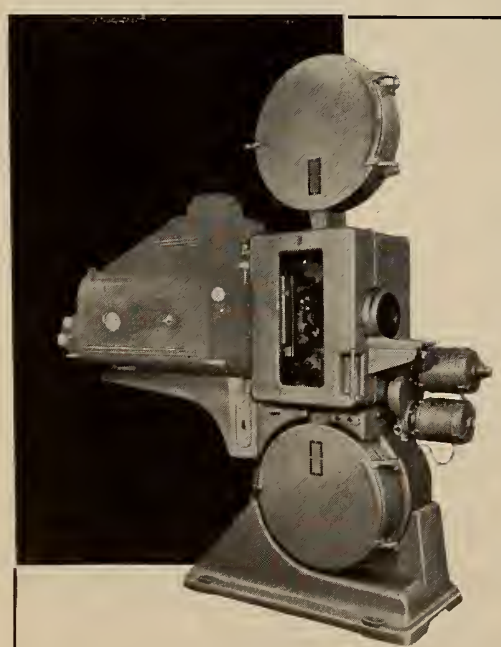
No sooner had triacetate safety film bowed in the theatre field than numerous complaints of focus difficulties emanated from projectionists. The new film base was blamed in nearly every case.

Investigation revealed that the rigidity of safety film was somewhat inferior to that of nitrate film, and that stresses and strains deform triacetate film more readily. This was, and to some extent still is, especially true when the film is subjected to the heat of the projector gate and arclamp beam. Although nitrate film becomes very brittle when heated, safety film buckles and warps out of shape to a greater extent, particularly if simultaneously subjected to mechanical stress.

Recent improvements in the triacetate base, however, have resulted in a safety film which is practically equal to nitrate film in rigidity and tear-strength, and certainly superior to nitrate film in aging characteristics. Triacetate safety film does not become so brittle with age and repeated use, it does not shrink nearly as much as nitrate film, it withstands wear better when cold, and, unlike nitrate film, it never disintegrates spontaneously.

Practically all the credit for the development and commercial production of a successful safety-film base must go to Eastman Kodak Co. The task was far more formidable than most people realize, for it was known at the outset that any new safety film must be far superior to the old diacetate and acetopropionate safety films to win acceptance in the 35-mm field. Thanks to Eastman, film is now not only *safe* but also *permanent.* Nitrate film literally rots (and sometimes spontaneously explodes) after 40 to 60 years of storage. Triacetate film will likely endure for a millennium; and precious negatives need never be lost beyond recall.

Even though some of the difficulties in focusing safety film must be attributed to failure of the film to lay flat over the aperture, it is definitely known that much of the trouble was caused by inefficient printing and by the use of duplicate negatives printed from shrunken master positives. Certain reissued pictures, it was discovered, were printed from dupes made from old re-



Holiday Greetings

from

PHILIPS

To projectionists everywhere go our warmest greetings coupled with the hope for a continuance of the friendly relationship begun with the introduction of the Philips 35- and 70-mm all-purpose projector used in the Todd-AO production of Rodgers & Hammerstein's "Oklahoma!"

PHILIPS — ***the finest in motion-picture projection equipment.***

Represented by:

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PHILIPS

lease positives, the original dupes and masters having been damaged or lost. The use of old sprocket step printers inherited from the days of silent pictures, and speeded up to meet release schedules, has been the cause of jumpy, as well as blurry, pictures. Safety film cannot be blamed for inept lab work.

Film Shrinkage and Sprockets

An increase in the diameter of the intermittent sprocket for longer print life with less tearing of the film perforations has been made possible by the low degree of shrinkage of triacetate safety film. Fresh film stock is perforated with a "pitch" of 0.187 inch (that is, the pulldown edges of two consecutive sprocket holes are 0.187 inch apart). If film did not shrink at all, a 16-tooth sprocket 0.952 inch in diameter would fit the perforations perfectly at all times.

Nitrate film, however, shrinks up to 1.6% after many projections, or when stored for a long period of time in warm, dry air. This extreme degree of shrinkage necessitates a sprocket-diameter of 0.937 inch to enable the teeth to correspond with the spacing of the perforations. In order to accommodate badly shrunken nitrate film, therefore, the diameter of the intermittent sprocket was standardized at 0.935 inch. Now, even though this size of sprocket saves the perforations of shrunken films from being torn away, it definitely weakens the perforations of unshrunken and slightly shrunken films because pulldown is effected by only one sprocket tooth at each side of the film.

Triacetate safety film is not known to shrink more than about 0.5%. This amount of shrinkage is accommodated by a 0.948-inch sprocket. But to permit the showing of moderately shrunken nitrate films without unduly damaging the sprocket holes, projector manufacturers have adopted 0.940-inch and 0.943-inch intermittent sprockets, the latter size being presently favored in America. With the complete disappearance of nitrate films, however, the size of the intermittent sprocket may be increased to 0.945 or 0.946 of an inch for more effective engagement of the film perforations and longer print life.

Projectionists are well aware of the tearing sound caused by the tendency of shrunken films to stick to the sprocket, a noise somewhat similiar to that produced by worn sprocket teeth. The larger the sprocket and the more badly shrunken the film, the worse the noise. This noise should not unduly alarm the projectionist if it be known that the sprocket teeth are in good condition, for damage to the perforations results only in the case of films that are severely shrunken.

It is interesting to note that the large-size intermittent sprockets have better wearing qualities than the old 0.935-inch sprockets. The teeth of the smaller sprockets wear off at the base; and the resulting notch or hook prevents the film from leaving the sprocket freely. The teeth of the larger sprockets wear much more evenly, usually without the formation of notches. Even when worn out, the larger intermittent sprockets are much less likely to roughen or tear the pulldown edges of the film perforations.

Progress in Color Films

Another worthwhile development which took place with the introduction of safety film was the use for the first time of standard positive, or projection, perforations for Technicolor and duplitized color prints. Negative, or camera, perforations having bowed sides were previously used for color-print stock to facilitate the best possible registration of the several superposed colored images—three in the case of Technicolor prints, two (one on each side of the film) in the case of the old duplitized type of color print.

Now, negative perforations are not too satisfactory for projection purposes because they have a tendency to check and crack at the corners. Prints punched with camera-type sprocket holes are comparatively short-lived for this reason. New sprocket teeth and registration pins designed for positive perforations made it possible to effect good color registration on standard print stock. Positive perforations are rectangular in shape, but have smoothly rounded corners which offer no weak points where tears may easily start.

The problem of fitting out color-film printers for positive film perforations

Wooden Base Shifter for CinemaScope

By JULIUS RALPH

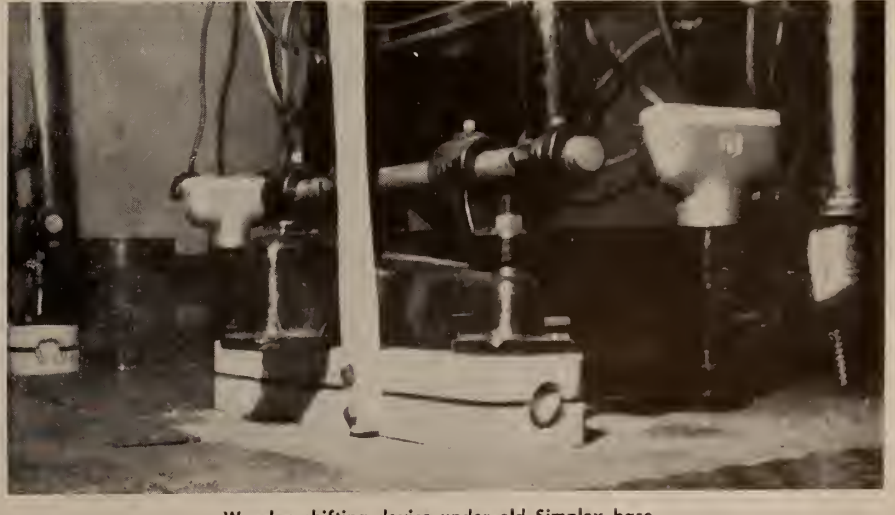
Member, Local 266, Jamestown, N. Y.

ALTHOUGH there are a variety of devices now in use for shifting a projector base for the transition between so-called "standard" projection and CinemaScope, I believe that the two I built for the projectors at the Palace Theatre in Jamestown, N. Y., are as simple and effective as any. Except for one steel ball and some screws, only hardwood is needed to construct these base shifters.

A look at the accompanying illustration is the quickest way to learn how my base shifter works. Shown is the rear of an old Simplex 5-point base resting on the shifter. Upper and lower sections of the shifter are grooved to receive half of the hard-wood dowel which can be seen protruding slightly at the right. This dowel, which is joined to the bottom section of the shifter by screws, acts as a slide bearing when the lever in the foreground is pulled and the projector inched into the proper position to fill either the CinemaScope or standard masking area of the screen.

Of course, the two front points or "legs" of the base must also move slightly when the position of the rear changes. This problem is solved in the following manner: One of the front legs acts as a pivot. It is supported by two 4-inch-square hardwood blocks of the same thickness as the illustrated portion of the shifter. This section pivots on a large countersunk steel ball inserted between the blocks.

The other front leg changes position slightly. Two more 4-inch hardwood blocks separated by a short dowel slide bearing support this leg in such a way that it can move slightly as the position of the rear of the projector is altered by means of the lever.



Wooden shifting device under old Simplex base.

was considered a tough one by film technologists. A Technicolor printer, for example, is amazingly precise in its action. It is able to transfer colored dye images from three separate "matrix" printing films and place them in exact superposition on the gelatine-coated print stock. The sprocket teeth and pins of the device must fit the film perforations exactly. The various films run through the printer very taut; and the machine unfailingly maintains exact positioning of all the several films involved in the printing process.

Shortly before triacetate safety film came into use, Ansco produced a new type of color film for both negatives and projection positives. Known as Ansco Color, the new film was similar to the Agfacolor multilayer dye-coupler film manufactured in Germany. The remarkable thing about this type of color film is that it is wholly photographic and requires no special cameras, printers, or processing equipment. It can be used in ordinary motion picture cameras, developed like black-and-white film, and printed on regular printers. The color is built into the emulsion of the film by the manufacturer.

The only drawback of dye-coupler color film is the high cost of making it. All manufacturers of motion-picture raw stock now make this type of color film; and its popularity attests to its simple processing, wide photographic latitude, high image-resolving power, excellent color reproduction, and, of course, its freedom from color registration difficulties.

Even before Ansco Color positives entered the theatre field, Ektachrome and other Eastman Kodak color negatives of the dye-coupler type had gained widespread acceptance for filming in natural color even when the release prints were prepared by the relatively inexpensive dye-imbibition process. Formerly, all Technicolor pictures were photographed with special 3-strip color cameras which produced black-and-white negatives containing the color values in latent form. Dye-coupler color negative used in ordinary cameras has gradually displaced the bulky and complicated Technicolor camera.

Industry acceptance of Ansco Color positive film for release printing was quickly followed by the appearance of Eastman Color print film, which supplemented the already popular family of Eastman dye-coupler color negatives.

(Continued on page 38)



from
American Optical Company
creator of the
Todd-AO System

Telephone Co. Goes Magnetic

The sound reproduction methods used by the Telephone Company to announce the time of day to dialers strangely parallel changes in sound reproduction methods for motion picture exhibition.

In the first method, employed by the Bell System in the early 1920's, a single telephone operator announced the correct time, as read from a regulated clock, into a network extending to each central office in a city.

Shortly afterward, the Audichron Co. of Atlanta, Ga., developed an automatic time announcement machine based on optical sound-on-film operation. More recently, the Audichron Co. completed the development of a new machine using magnetic recording. The magnetic recording medium used on the new machine is something called "talking rubber" developed by Bell Laboratories. The machine is said to provide a superior speech quality as well as greater flexibility in use.

GE Postpones Color Tv

The new 22-inch color Tv tube now being developed by General Electric is still more than a year away from actual market distribution. RCA presently is distributing a set priced at $795. G-E's objective is a set that will sell for less than $500.

An "Ideal Theatre" Is Planned For Historic Williamsburg

Two large screens, lighted from a single projection room, will be employed so that the entire audience has a comfortable, undistorted view of the picture.

AN IDEAL theatre in which every seat is a perfect one, is being planned for Williamsburg, Va. As it will work out the theatre will actually be two theatres under a single roof, constructed back-to-back and sharing a common projection room. The dual theatre project is sponsored by a group known as Colonial Williamsburg, Inc., supported by a Rockefeller grant, for the purpose of affording visitors a more realistic sense of life as it was in the early Virginia capital.

To further enhance the 18th century atmosphere of restored "Colonial Williamsburg," it was decided to make use of the latest motion picture production and exhibition techniques. Ben Schlanger, noted theatre architect was brought in to design the proposed ideal theatre. A number of Schlanger's well-known ideas, such as maskless screening, peripheral modulation, and sympathetic surround, will be incorporated in the projection system.

Williamsburg stands as a living symbol of American colonial times. Its historical importance and interest can be measured by the more than half million visitors that come each year to view the hundreds of colonial homes, taverns, shops, and other buildings that have been restored at a cost of about $30,000,000. Guides in authentic colonial dress direct the tourists around the history-laden town.

It is to give these visitors an even more realistic sense of life in this early Virginia capital, that Colonial Williamsburg, Inc. is planning its proposed ideal theatre. The idea is to produce a film picturing life in 18th century Williamsburg that would then be shown to visitors on their arrival. For this non-commercial orientation film to have its most forceful impact —in transporting the audience back in time and place—it was felt that it had to be shown in a distractionless and realism-provoking theatre.

Arthur L. Smith of the sponsoring group outlined the proposed project before the delegates of the recent SMPTE convention at Lake Placid, N. Y. He explained that the aim of the theatre would be to achieve a high degree of participation and realism from the point of view of the audience. Construction would be such that the viewer would be lost in an "optical vacuum," according to Smith. Any distractions, whether actual or psychological, such as architectural forms, projector noise, heads of viewers in front, would be eliminated.

Striving zealously to make their unique project a success, the group called in additional consultants to tackle specific problems. Walter Hicks of Reevesound Co. is the advisor on sound engineering; C. S. Perkins and Edward Seeley of Altec joined the group as sound equipment engineers; and Dr. Leo Beranek of Bolt, Beranek & Newman, took on the task of acoustic design.

A wide-screen participation type of show was decided on, set up in two auditoriums, back to back, sharing a common projection booth. The reason for two small auditoriums, rather than a single larger one, is to insure the perfect location of every seat in the house. Each auditorium will have eight rows of seats, capable of handling 250 people for a half-hour showing of the orientation film. A wide-film process rather than 35-mm will be the method of projection, on a screen or 30 by 60 feet.

However, to achieve the goal of "optical vacuum," it was found necessary to eliminate any comparative dimensional or scale clues in the auditorium. This means that the curved screen will not be masked. Instead the screen image will fade out gradually at all edges.

"The effect," Smith said, "would be much like peering inside a television tube with the small end knocked off."

In discussing the fading of the picture at its edges, which he called

(Continued on page 40)

Greetings and Best Wishes

We welcome this opportunity to extend the Season's greetings to our many friends in the projection craft who, working together with us thru the years, have enabled us to progress in the drive-in theatre industry.

DRIVE-IN THEATRE MANUFACTURING COMPANY
505 West 9 Street Kansas City 5, Mo.

Season's Greetings

from

CLAYTON PRODUCTS COMPANY

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In The SPOTLIGHT

We extend a heartfelt wish for a joyous Holiday Season to our many friends who have been so gracious and helpful during the past year. We are deeply conscious of our indebtedness to all those who have made our path that much easier by virtue of their many kindnesses and courtesies. To one and all, wherever located throughout the world, we say — —

The Very Best of Everything Now and in the Years to Come

• The merged AFL-CIO held its first convention at the 71st Regimental Armory in New York City the week beginning December 5. George Meany AFL president, was elected president of the AFL-CIO; and William F. Schnitzler, AFL secretary-treasurer, will fill the same post for the merged unions.

IA President Richard F. Walsh was selected one of the top three of 27 vice-presidents of the new labor federation. In addition to Walsh, IA delegates to the convention were Harland Holmden, general secretary-treasurer; Thomas V. Green, Local 21, Newark, N. J.; Michael J. Mungoven, Local 25, Rochester, N. Y.; and Joseph McNabb, Local 154, Seattle, Wash.

• William C. Scanlan, IA representative, was guest of honor at a testimonial dinner given by District No. 3 (New England), at the Hotel Bradford in Boston on December 4. IA President Walsh and Ken Kelley, official of the Massachusetts AFL, were among the principal speakers. Scanlan was presented with a diamond-studded IA pin.

• Chattanooga, Tenn. Local 259 celebrated its 45th anniversary last month at a dinner-dance attended by top IA officials and many prominent civic and industry leaders. Burton Lowry, president of the Local, was master of ceremonies.

• Fred Beard, popular member of Hollywood Local 165 and one of the old standbys on one M-G-M lot in Culver City, is now associated with the Mike Todd organization and is working at the Kling Studio in Hollywood. Beard was a member of Metro's projection crew for the past 20 years, and he has the best wishes of his former co-workers in his new setup.

• IA Locals 223 (Projectionists) and 23 (Stagehands), Providence, R. I., ended a year-long strike against the Strand Theatre in Pawtucket with the signing of a new agreement between the Locals and the New England Theatres, Inc., owners of the struck house. The pact, which was termed "satisfactory" to all concerned, calls for the return to the theatre of *all* of its former crew—four regular projectionists and one relief man, plus one stagehand.

The Locals called a strike October 1954 when two years of negotiations on a new contract ended in a deadlock. They contended that the theatre management sought to reduce both manpower and wages of the projectionists. The theatre was picketed ten hours daily during the entire year of the strike. The new contract includes the maintenance of two-man projection room operation, the most bitterly contested issue in the negotiations.

DO YOU JUST BELONG?

Are you an active member,
The kind that would be missed?
Or are you just contented
That your name is on the list.
Do you attend the meetings
And mingle with the flock?
Or do you stay at home
And criticize and knock?
Do you take an active part
To help the work along?
Or are you satisfied
To only just belong?
Do you ever go to visit
A member who is sick?
Or leave the work to just a few
And talk about the "clique"?
Think this over, member —
You know right from wrong!
Are you an active member?
Or do you just belong?

25-30 CLUB BULLETIN.

• One of our overseas subscribers, Ivan Bailue, from Sydney, Australia, stopped in at the IP office last month while on a trip around the world. He was one of the projectionists at the Variety Theatre in Sydney, where a disastrous



Ivan Bailue, Sydney Australia

fire occurred last year and barely escaped with his life. "After getting out of the theatre alive," he said, "I didn't want to waste any more time. I had been promising myself a trip around the world for some time, and after the fire I decided to take it without further delay."

Bailue and his partner, Jack Lynch, received severe injuries when a fire broke out behind the screen and bellowed across the theatre, with explosive gasses blowing out the front doors in about three minutes. Lynch was hospitalized for many months. Fortunately, the projection room was the least damaged part of the theatre. At the time of the fire one of the projectors held a reel of nitrate film and had sufficient heat penetrated the projection room there probably would have been not only greater physical damage to the theatre but a loss of life among the theatre patrons. As it was, there were not many people in the theatre at the time of the fire due to the fact that it was a holiday and the number of people injured was low.

• Los Angeles Local 150 and the United Artists Theatre Circuit recently concluded a pact covering the Todd-AO road show of "Oklahoma" now playing at the Egyptian and other United Artists theatres in the Local's jurisdiction. The agreement calls for the same number of men as would normally be employed under provisions of standard contracts, but with an increase in the

The Ole Crank Twister

This Month He Belabors Us With His Ideas on Proper Lamp Lubrication

EVER sense Congress killed that trash mail law, my fan mail has been fallin off somthin awful. It used to be that everybody was writen and tryin to get Ole Twisters endorsement for their particklular product because of his acknoleged wisdumb. Yep, fame kin be quite fickel at times. But goin through the mail yestiday, I got a nice letter from a lad down Arkinsaw way. A penny post card it was. An not addressed to OCCUPANT either. It was addressed proper like to the Ole Crank Twister, CHIEF of the Carousal Theatre.

Nice young lad this was. An he asks for advice in respeckful tones about the proper lubrikashun of lamp parts. It appears that he is havin plenty of trouble with stickin of the slidin members of his H-I lamps resultin from the high juice he burns at his drive-in. Weel son, you sure had the right idea in applyin to the Ole Twister with yore problems. Certain other unnamed parties would do well to swaller their false pride an apply to the fountain head of pracktickal projeckshun wisdumb.

For the slidin members of the lamp there is only one proper lubrikant that will not gum an cause stickin. Thats powdered graphite. Powdered graphite aint so popular though because the dratted stuff won't stick to a smooth surface. Sometimes they use colloidal graphite, kerosene and other forms of petroleum to get it to stick. But it dont do much good. An eventual bindup is the sole dividind.

Fortunately—and here I'm givin you the benefit of the Twisters long experience—there is a sticker and carrier for powdered graphite that wont produce no meloncoly results. What do you think that is? Well its water. Water is the ideal carrier and sticker that will leave no trace due to its complete evaporation by heat.

Timid souls will argue that the parts will rust. But a dolt should know that water doesn't cause rust. Its the air in the water. An how can rust take place anyway when the water in the mixture is promptly evaporated? Start out right son by removin every bit of petroleum gum from the rods an bushings. Clean out the bushings with carbon tet. Sand off the rods.

You add just enuff water to yore powdered graphite to make a thin paste. Then you take a lettle brush so you wont get yore lily white hands dirty. With the brush you coat the rods with the mixture. You work the slidin members back and forth to thoroly coat the inside of the bushings. Do this twice a week on a cold lamp an yore stickin problem is past tense.

Across the street at the Bilikin Theatre is a cookoo who prides his self on bein edjacated. He insists on mixin his graphite with something he calls aich-too-oh. Maybe this aich-too-oh is OK also. But men! Lets keep it simple an use tride and true water in yore powdered graphite an avoid complekachuns.

FRANK W. MACDONALD
IA Local 199, Detroit, Michigan

hourly wage rate. Under the terms of the new Todd-AO deal, Local 150 members receive $3.70 per hour—the same scale as for Cinerama showings.

• The 25-30 Club of New York will hold its annual dinner-dance on Sunday, January 8, 1956, at the Hotel Empire, 64th Street and Broadway, New York City. Top entertainment plus many surprises are in store for the guests, and from all indications at hand it promises to be a gala night indeed. Tickets may be purchased from Benjamin Stern, financial-secretary for the Club, 600 West 218 Street, New York 34.

• One of our out-of-town visitors last month was Gaetano A. Buttafarri, representative of Ferrania, color film manufacturers in Milan, Italy. He was anxious to obtain back issues of IP, several of which we were fortunate enough to have on hand.

• Pinch-hitting for an ailing projectionist in a small theatre in Racine, Wis., back in 1905 when he was a lad of 14, is what started Hubert J. Soens, charter member of Racine Local 460, on a career as motion picture projectionist that has lasted 50 years. Born in Racine, November 2, 1891, Soens practically grew up in show business



Hubert J. Soens

and in 1911, and after working several years in various movie houses, he called upon Milwaukee Local 164 to help him organize the theatres in Racine. In 1912 Racine was organized as an auxiliary to Local 164 and Soens is the proud possessor of the first permit issued. Five years later, in 1917, he realized his ambition when the IA chartered Racine Local 460.

An ardent unionist, Soens has served the Local in many official capacities, and is to this day an active worker in union affairs. His union activities plus his regular job as projectionist at the Rialto Theatre keep him pretty busy, but when time permits he indulges in his hobby of boating and fishing. Although he takes great pride in his 50-year career as projectionist, he is extremely proud of the fact that he is a GREAT grandfather at the age of 64.

• A ruling of far-reaching importance was handed down recently by the Pennsylvania state supreme court in the action brought against Local 451, New Castle, Penna., by the owners of the Skyline Drive-In Theatre. The ruling upheld the decision of a local court in Lawrence County, Penna., that refused to issue an injunction against the union officials in an effort to restrain them from picketing the drive-in theatre.

The Skyline had been picketed by members of Local 451 since early last summer when the theatre management discharged one of the two union projectionists and replaced him with a non-union man. Although there has been no written agreement in effect for the past five years, the Local claimed that one of the owners repeatedly told its representatives that such a contract was not necessary because the same conditions would prevail. Local 451 officials contended that an *oral agreement to continue the terms of a written pact was just as binding as the original contract.* Both courts agreed with Local 451. and this ruling is certain to affect other similar cases.

LETTERS TO THE EDITOR

An Australian Outlook

To the Editor of IP:

Thanks for the continued excellence of puhlication which is a real lifesaver to us maligned projectionists. Your prohlems in America appear much the same as ours in the new fields of presentation, and your viewpoints are sane and real. This is deeply appreciated.

In this country curved screens, wide screens, CinemaScope, etc., created panic among leading city shows — some of which made two or three changes in sizes and types of screens, a few returning to the orthodox flat screen. Sound levels at the introduction of CinemaScope were loud heyond all reason and nearly killed the new art with many of the public.

I was rather intrigued hy Frank MacDonald's humorous "Crank-Twister" effusion in the June issue. The "Dazzel-Lite" shutter heing changed to a one-winger forcihly reminded me of a unique experience here some years ago. Our projectors then had the front two blade shutter (made of cardhoard). During the newsreel the hright assistant's hand got in the way of the shutter, hreaking the flicker blade completely off. The screen result in extra light was amazing, but strangely the flicker, while pronounced, was not as great as one would expect. The machine vihration, however, was terrific. What would have happened had it been the other hlade is too horrible to even think about, but we finished the newsreel on one hlade.

I am reminded of another innovation which was introduced early in the 1920's, but which I never saw in operation although widely advertised at the time. It was in two forms, hut the idea was the same in each case — a two-bladed shutter allowed some light through to the screen during the pull-down period and flicker hlade intervals. One type had a semi-transparent material in the blades, while in the other, hoth hlades were of finely perforated material. I believe one was marketed under the name of "More Light" and the other "Extra Lite." I have often wondered if this idea was sound in principle or whether it would reduce the light hy giving a grey effect as I have sometimes seen with a slight shutter ghost.

Once again I thank you for your fine puhlication, which really enables us projectionists to keep up to date with honest sane statements and your candid opinions.

REG. A. STEWART

Wangaratta, Australia

EDITOR'S COMMENT: Perforated shutter blades certainly do revive memories of the old days. We remember the Extra Lite shutters well. Instead of increasing the brightness of the picture, as they were supposed to do, such shutters accomplished nothing beyond fogging the screen with a gray light and a misty travel ghost. The basic idea was definitely "all wet."

We recall a fellow who firmly believed that he could improve the color of his yellowish low-intensity illumination with a shutter having blades of blue spotlight gelatin. With painstaking thoroughness he constructed a metal skeleton shutter to hold the blue gelatin "wings." The shutter actually did whiten the light — and it did something else, too. As might be expected, it embellished the picture with blue travel ghosts!

Whose Screen Is Biggest?

To the Editor of IP:

Since we are now entering the drive-in era in South Africa, could you please give me details regarding the largest outdoor screen in the world, and also of the largest screen in in-door theatres. We have here in South Africa a numher of advertisements in newspapers claiming that such and such drive-in or theatre, has the largest screen in the world.

Regarding the taking over of the holdings of the African Consolidated Theatres Ltd. and their suhsidiary companies, consisting of some 140 theatres, hy the 20th Century-Fox Films Ltd., all these theatres are covered hy an agreement with our Union, which agreement has still some five years to go. A strange thing to record, is that the Fox group in South Africa has never signed an agreement with our Union, although they have heen approached hy us on many occasions in an endeavor to get their operating staff under our hanner.

Sincere greetings to your American projectionists, and the assurance that this Union will welcome any correspondence with interested parties in America.

G. D. BURRELL
General Secretary

South African Cinematograph
Operators Union, Johannesburg.

EDITOR'S COMMENT: Like Mr. Burrell we find ourselves slightly confused by the fact that a number of large drive-ins are evidently claiming the title of the "largest in the world." A drive-in recently erected near New York City at Bayshore, Long Island, has a plated aluminum screen 121 feet in width and 65 feet high. There are indoor theatres such as the Gaumont in Paris which have used screens over 70 feet in width. The Radio City Music Hall in New York used a screen 70 feet wide for a CinemaScope production. Fine results were recently obtained by the Paramount Theatre in New York with double-frame VistaVision horizontal projectors and a picture about 62 feet in width.

Wage Dividend at Kodak

A wage dividend estimated at $32,175,000 will be shared next March by about 51,000 employees of the Eastman Kodak Co. This dividend is the highest to be paid by the company since the plan began 43 years ago. Eligible persons will receive $30.25 for each $1,000 earned at Kodak during the five years 1951-55.

The wage dividend is voted by the board of directors and is based on the cash dividends declared on the common stock during the year and on individual earnings over a five-year period. It is paid in addition to regular wages and has no effect on wage rates.

EQUIPMENT EXPERTS ANSWER QUESTIONS AT TESMA FORUM



Seated on the dais of the theatre equipment forum during the recent TESMA-Allied convention in Chicago, was the impressive group of projection equipment experts and engineers shown above. Larry Davee, of the Century Projector Corp., standing before the microphone at center, was moderator of the lively discussion where all sorts of questions and complaints from attending exhibitors and projectionists were answered by an expert on the particular phase of projection involved. From left to right, the panel of experts includes: F. W. Keilhack, of the Drive-in Theatre Mfg. Co.; Al Boudouris, of EPRAD; J. W. Johnstone, National Carbon Co.; Arthur Hatch, Strong Electric Corp.; Davee; Ross Snyder, Ampex Corp.; J. F. O'Brien, RCA; J. A. Fetherston, Kollmorgen Optical Corp.; Leonard Satz, Raytone Screen Co., and Fred Aufhauser, Projection Optics.

Motiograph-Trad Theatre-Tv Projector

THE NEW Motiograph-Trad portable Tv projector, model TPM-300, is now available to theatres throughout the country following introductory demonstrations in New York City and at the recent TESMA-TEDA trade show held in Chicago. Motiograph is exclusive distributor of this Tv projection unit which is manufactured by Trad Electronics, of Asbury Park, N.J.

The TPM-300 is a completely self contained mobile projection unit, weighing approximately 420 lbs. It can provide a large screen picture. up to 27 by 36 feet, and is designed to meet conservative equipment budgets. Price per unit is quoted at $3,750, with 90 days delivery.

The Trad projector was shown publicly for the first time at Asbury Park for the Marciano-Moore fight Sept. 24th last. The throw distance used then was 72 feet, casting a clear picture 24 feet high by 32 feet wide. More recently it was exhibited to the trade in the ballroom of the Park Sheraton Hotel in New York and at the TESMA convention in Chicago.

Uses 120-Volt Current

The TPM-300 can be plugged into any 120 volt line in indoor or outdoor theatres, auditoriums, schools, hotel banquet rooms, meeting halls, and the like. A single cabinet console contains complete audio and video systems with power unit. monitor, and all controls. No additional wiring is required, but for off-the-air broadcasts, connection to a suitable antenna has to be made.

An improved Schmidt optical system in an optical barrel is mounted on top of the cabinet. Elevation angle of the optical barrel is adjustable. Variations of the TPM-300 model are the TPM-310 with two Schmidt optical systems located on top of the cabinet and the TPM-320 with two remotely located optical systems. All three of Trad's 300 series can be used for both closed circuit and off-the-air, each set containing a VHF receiver and a UHF adapter.

The TPM-300 model uses a regulated and metered 40 K.V. adjustable high voltage power supply. An exclusive Trad engineering development, known as the Dynamic Contrast Expander circuit, provides far greater light output than previously, and also increases the dynamic range of contrast. A complete audio system includes a 12-watt public address amplifier with multi-match output for use with closed circuit sound or incidental music.

Operation Simple

Operation of the new Trad Tv projector is fairly simple. All controls, video, audio, and synchronizing, are easily accessible at the upper portion of the cabinet. Focus at all contrast ranges is immediately adjustable on the control panel. Each unit is completely fused with overall line power protected by a magnetic circuit breaker for protection and safety.



Motiograph-Trad closed-circuit Tv projector, Model TPM-300

In addition to the control console on rubber tired casters with demountable doors, a complete breakdown of the equipment is as follows: line amplifier and master control, receiver monitor (includes 12-watt audio amplifier), sweep chassis and power supply, A.C. cable, Schmidt type reflective optical barrel, and a full set of tubes, including 5TP4 or 5AZP4.

The technical specifications, taken from the descriptive brochure issued by Motiograph, are as follows:

DIMENSIONS: 53″ by 27″ without barrel.
INPUT POWER: 117 volts, 60 cycle, single phase (can be adapted for different power sources).
VIDEO INPUT: (a) 75 ohm terminated coax jacks; one volt peak negative input level for full brilliance and contrast. (b) 300 ohm balanced line for off-the-air broadcast and presentation.
AUDIO INPUT: (a) 600 ohm balanced line for closed circuit audio. (b) microphone. (c) phonograph, crystal cartridge type. (d) off-the-air broadcast sound. Choice of above inputs completely and instantly available by means of "Function Switch" on control panel.
AUDIO OUTPUT:12-watt push-pull audio system with 3, 8, 15 and 500 ohm outputs.

"Solar Furnace" Resembles Projection Arc Lamp

A recent development in the field of sun power research, known as a "solar furnace," bears a striking resemblance to the arc-lamp operation in motion picture projectors. The solar furnace, of which there are four at the Convair plant of General Dynamics Corp., in San Diego, Calif., is a reflector unit capable of converting sun rays into practical power.

Although the basic principle is similar in both the arc-lamp and solar furnace, the effects of each are definitely opposed. The purpose of the solar furnace is to produce heat instead of light, and it can do this to the degree of 8500 Fahrenheit. As every projectionist knows, the less heat in an arc-lamp, the better.

The solar furnace is actually a special kind of mirror. The mirror face is made of a single piece of polished quarter-inch aluminum formed into a parabolic reflector. A mechanism keeps the mirror slowly turning, so that it always looks straight at the sun. The parabolic shape of the reflector focuses all the sun rays that strike it onto a point the size of a dime.

At a distance of two feet away, the heat of the concentrated sunshine is able to cause a tough metal like tungsten to burn almost immediately. At the same distance a piece of magnesium oxide has been shattered into countless particles.

Research on sun power has already produced such workable items as solar cookstoves, solar house heating equipment, a solar refrigerating plant, and solar water pumps. Two Tv set makers are putting the finishing touches on solar energized Tv receivers. Among the many ideas still in the experimental stage are a solar irrigation project and solar house cooling units.

A solar energized radio receiver may be demonstrated shortly by a midwestern manufacturer. In this design, six or seven light-sensitive silicon cells will be used to charge a battery which in turn will be used to power the receiver. Because the cells presently cost approximately $25 at manufacturer's level, the receiver is expected to be too costly for immediate mass production.

The solar battery may be the most important achievement yet in solar energy. Now being developed by Bell Laboratories, research men point out that at present the solar battery is small

(Continued on page 37)

Rear-Projection CinemaScope Aboard Ocean Liners

Unique adaptation on board U.S.S. Independence and U.S.S. Constitution makes rear projection CinemaScope possible in the ships' theatres.

By NORMAN WASSERMAN

THE PROBLEMS involved in ordinary rear projection have been with us for a long time now, and for the most part they have been satisfactorily solved. Going as far back as 1928, the chain of Trans-Lux theatres have been using Trans-Lux lenses for rear projection with good results. Then along came CinemaScope and with it the problem of converting ordinary rear projection to rear projection CinemaScope. As far as is known, there is no theatre at the present time using rear projection CinemaScope.

There recently arose the further unique problem of installing rear projection CinemaScope on trans-Atlantic ocean liners. The American Export Lines wanted just this kind of installation on board each of its two prize vessels—the *U.S.S. Independence* and *U.S.S. Constitution.*

For more than six months a number of motion picture consultants experimented unsuccessfully in an attempt to install the required CinemaScope rear projection. Finally, Chester Case, head of services and operation for American Export Lines, called in Jack Schaffer, member of IA Local 650, Westchester County, N. Y., who had worked on rear projection projects before.

Presently supervising motion picture installations for distributor Joe Hornstein, Inc., Schaffer visited both the *Independence* and *Constitution* and examined the equipment that was there. Inside of 30 days, including much time spent waiting for the ships to arrive in port, he had rear projection CinemaScope operating without a hitch on both ships.

Why Rear Projection?

The need for rear projection is necessary because of inadequate space for front projection. Inadequate space may result from the architectural design, say of an auditorium, that does not allow for a projection room. Or, a small theatre, wishing to conserve space in the back for seats, might accomplish this through rear projection, deliberately eliminating the projection room. Still another example of inadequate space would be a low ceiling, making it impossible to throw a proper angle of light from the back of the auditorium without interference. As a matter of fact, all these space limitations prevailed on board both the *Independence* and *Constitution,* so that rear projection was the only method of projection possible.

In 1928 Trans-Lux constructed a series of small theatres for newsreel showings. These theatres had no balconies and because of the spatial limitations it was decided to install rear projection. A special Trans-Lux rear projection lens was designed just for that purpose. All this worked out very well until CinemaScope came along.

Since a rear projection lens is still not available for a large CinemaScope picture, Trans-Lux is now constructing projection rooms in the rear of their theatres. These projection rooms are designed to accommodate a CinemaScope picture of approximately 28 feet wide, compared to the previous rear projected picture of only 12 feet wide. Between $30,000 and $50,000 each have been spent in converting Trans-Lux theatres in Philadelphia, Washington, and New York. Jack Schaffer supervised the sound and projection equipment change-over in the converted theatres.



Jack Schaffer, shown removing the Super Panatar anamorphic lens from one of twin projectors now being used for rear projection CinemaScope aboard U.S.S. Independence.

The chief disadvantage of rear-projection CinemaScope concerns the difficulty of adapting it to a large-sized picture. Even with Schaffer's rear projection setup, picture size is limited to 15 feet in width. However, a larger size lens is being designed by the Panavision Co. of Los Angeles.

The difference in operational procedure from the projectionist's point of view is minimal. For rear projection, normal threading and other procedure is followed. The chief difference is that the projectionist will see the image in reverse and he will have to manipulate his controls with the reverse image as his guide.

Trans-Lux Lens

The lens developed by Tran-Lux specifically for rear projection consists of eight elements. Moving from the positive end of the lens, which is nearest the film, toward the negative end, closest to the screen, we find first a pair of dublets, each dublet comprised of two elements cemented together. Next is the prism in the center of the lens dividing the positive and negative elements. As the prism serves to reverse the image, film should be threaded normally. Following the prism are three negative elements that face the screen.

Focal length of the Trans-Lux lens is 28.5-mm, with a ratio of a one-foot wide picture for every 1.305 feet distance to the screen. In the Trans-Lux theatres, however, the adjusted focal lengh was 23.5-mm, with a ratio of 1.079 projection distance to a one-foot wide picture.

The Trans-Lux lens barrel is shaped like an elbow, enclosing a 45-degree angle. Therefore, in order for the face of the lens to be parallel to the plane of the screen, the projector holding the lens must be at a compensating 45-degrees. For two projectors, an angle of 90-degrees must be established between them.

When Jack Schaffer was called into consultation on the *Independence-Constitution* CinemaScope problem, it was not the first time he was thrown up against rear-projection sticklers. In 1943 he developed a rear projection setup using a 16-mm projector to secure a 4½ by 6 feet picture on a mock

Tv receiver, with only seven feet separating projector and screen. This was done for the RCA commercial Tv department after engineers had decided it was not practical. With the RCA Service Co., Schaffer then toured the U.S. for eight months demonstrating the potentialities of commercial television on his mock Tv receiver.

Initial experimentation aboard the *Independence*, for only two days at a time whenever the ship docked in New York harbor, was conducted with the aid of a Trans-Lux lens on loan to Schaffer by the manufacturer expressly for this CinemaScope conversion project.

Rear Projection C'Scope

As the focal length of the Trans-Lux lens was a short 28.5mm, it tended to enlarge the image too rapidly to allow it to be picked up completely by the elements of the CinemaScope lens. By removing one of the front elements of the Trans-Lux lens and changing the position of the objective lens in the lens barrel, the focal length of the lens was changed, thereby forming an image small enough so that the CinemaScope lens would capture the complete picture without any distortion.

Special brackets had to be developed to position the anamorphic lens properly. It was found that the only type of anamorphic lens physically capable of fitting this particular job was the Super Panatar variable lens, Model 400, distributed by the Radiant Manufacturing Co. of Chicago.

The constant pounding of the ship at sea was another problem, continuously threatening to throw the entire setup out of alignment. To safeguard against this, all adaptors and brackets were securely doweled and keyed.

The adaptation, as it now stands, makes it possible to show not only CinemaScope, but regular and wide-screen presentations as well, the changeover involving just a simple procedure. The same lens is used in the same position for all three types of presentations. All that is necessary is to hook on the anamorphic lens or else remove it when not in use. Focus is fixed at all times for either CinemaScope, wide-screen or regular projection.

The CinemaScope pictures on the Independence and the Constitution are approximately 12 feet wide. This comparatively small size is due to the restricted space of the auditoriums (150 seats) which includes extremely low ceilings, as well as to the limitations of the lens attachment.

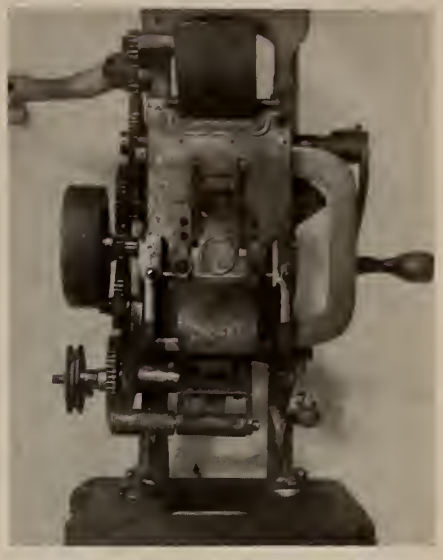
Projectionists operating machines on trans-Atlantic liners whose home port is New York come under the jurisdiction of IA Local 306. Jack Schaffer has been a member of Local 650 for more than 25 years. As former motion picture license examiner of the city of New Rochelle, N. Y., for five years, he once conducted a refresher course in conjunction with Local 650 to help projectionists gain their licenses. Schaffer now feels it is possible to show CinemaScope pictures in any theatre that is equipped with Trans-Lux rear projection lenses, as long as too large an image is not required.

Ray Brian — Historian of Motion Picture Projection

WHEN A MAN earns his living in a field that is also a close hobby to him, he is bound to produce something of note. Ray Brian, business agent of Local 434, Peoria, Ill., is just such a man and IP is proud to bring his contribution to the attention of its readers.

For many years Ray Brian has collected data on every conceivable type of projection equipment. The result by this time is a store of information that probably goes unmatched anywhere in the world. Still not completely satisfied, Brian goes on collecting, and will appreciate any additional item anyone has to offer. Readers having such information are invited to contact Brian through the offices of IP.

Following is a listing of the J's and K's, our sixth installment, of a letter by letter alphabetical rundown containing more than 350 items. With the exception of those items marked here with an asterisk, Brian has photographs of all the projectors named.



Geo. Knook's "Peerless" of 1908.

JOLY—mode in Fronce, 1895.
JOY—mode in 1898.*
KALEE—Gaumont-British Co., since 1910.
KAMM—mode in Englond, olso known os "Kamatograph," since 1910.
KAPLAN—Som Koplon, New York City, 1923.
KATHOSCOPE—mode obout 1900.*
KINETO—mode in Englond, 1915, by Moy.
KINEMATOGRAPH—Joseph Menchen, 1899.*
KINETOSCOPTICON—Chos. H. Oxenhom, 1896.
KINAK—. . .*
KINEBLEPOSCOPE—mode before 1900.*
KINECLAIR—Eclaire Film Co., 1908.
KINEMACOLOR—Chos. Urbon ond Geo. A. Smith, 1908.
KINEMATOTHERM—made before 1900.*
KINEOPTOSCOPE—Rilsy Bros. of York, Eng. lond, 1896.
KINESETOGRAPH—mode obout 1900.*
KINESTEROGRAPH—mode obout 1900.*
KINETOGRAPH—Newmon & Guordio, 1896.
KINEVITAGRAPH—mode before 1900.*
KINOGRAM—17.5-mm.
KINODROME—Bell & Howell, 1906 to 1916.....
KOEHLER—Koehler Opticol Co., NYC, 1917.
KOLOGRAPH—Lowrence D. Kohlmeyer, 1914.
KINORA—made by Lumiere's in Fronce, 1912.
KINEOPTICON—Birt Acres, 1896.*
KINEOPTIKON—Joseph Menchen, 1906.
KINOPTICAN—Ernemann, 1930.

Rise in Film Production

On the basis of the number of films already launched during 1955, Hollywood will wind up with its biggest year since 1952. Major studios during the first ten months of 1955 have started 169 films, an increase of 14% over the 148 during the same period last year. Figures for the independent studios show a drop to 45 this year as against 52 last year. A projected estimate for the entire year of 1955 indicates a total of 204 films by major studios, and close to 60 for the indies.

Columbia leads the majors in projects started since January, 1955, with a total of 34, compared to 26 during the first ten months of last year. Paramount is the only major to fall considerably below last year's tally, starting 10 films this year against 16 in 1954.

B & L's 16-mm CinemaScope Lens

A new 16-mm anamorphic projection lens, which combines both prime lens and anamorphic expander, has been marketed by Bausch & Lomb. The lens requires no brackets to support it on the projector and will fit all popular makes.

Setting Up 16-mm CinemaScope Roadshow for Business Film†

Many technical problems were encountered but results on the wide, portable screen justified the effort.

By JERRY FAIRBANKS
Jerry Fairbanks Productions, Los Angeles

INDUSTRIAL leaders are realizing more and more each day that the commercial motion-picture medium, when properly used, can tell the story of their company, organization, or product more effectively than any other existing media. This realization has been aided by the incorporation of every technical advancement in the motion-picture business in order to make the most effective presentation possible.

When Chrysler planned its 1954 dealer meetings to introduce 1955 cars, it was vitally important to them that their new models be presented in the most dramatic manner. First impressions are lasting ones and, therefore, it was very important that the first look dealers would get of this new car be as impressive as possible.

An obvious answer was to take advantage of the latest motion-picture technical advancement, CinemaScope. The screen proportions of this new filming technique are ideally suited for motor cars. The enthusiastic acceptance of this suggestion immediately brought to light the fact that a great many technical problems were going to be encountered in order to present the picture in the most effective and acceptable manner.

First of all, since approximately thirty dealer meetings were anticipated, in already contracted locations, it became obvious that some type of portable 16-mm equipment would have to be used. All these locations were in hotel ballrooms, civic auditoriums, dining rooms, etc., where 35-mm CinemaScope installations were not only nonexistent but impractical as well, in the time allotted and within the budget requirements.

A big problem to be faced was the projection equipment and the screen to be used. The screen had to be readily portable, and yet capable of being set up in a short period of time and giving the maximum screen surface possible.

Large, Portable Screen

The Radiant Screen Corp. of Chicago had just such a screen under development. The largest screen of a really portable nature that could be devised, they felt would give a 21-foot x 8½-foot screen surface. This would be supported by a 24-foot x 10-foot aluminum frame that could be broken down for shipment.

Since so many dealer meetings were to be covered in such a short period of time, it was necessary to plan the travel of these units from most points by airline. Therefore, all the equipment had to conform with the ability of the airlines to handle the units when packed for shipment.

The screen presented the greatest problem. The frame when knocked down and packed represented a package 12 feet in length which was the maximum that would fit into an airliner's baggage compartment. As a matter of fact, it had to be a big airliner at that. Several of the schedules had to be rerouted because nothing smaller than a DC-6 could accommodate the size of the units.

In order to secure the most dramatic presentation of the car it was decided that all events leading up to the first glimpse of the car itself would be filmed in normal screen proportion so that at the appropriate moment the wide screen could be used and the car presented for the first time.

This injected additional problems, not in production, but in the presentation thereof. First of all, a set of portable drapes that could be packed with the screen had to be designed and constructed to work on a traveler that would allow the drapes to reduce the screen area to normal picture size for the first half of the film and then on cue to open to the full width of the screen for the CinemaScope presentation.

Even more intricate was the necessity of devising some method of swinging the anamorphic lens into place on the projection machine at the proper moment in the film. The definition problem being as critical as it is, this device which was developed in our shops had to be built to a very fine tolerance with minute adjustments for centering the picture on the screen as well as lining it up optically with the projection lens itself.

A projector had to be secured that not only was portable, but that had an arc light source and a physical construction that would allow for the interchange lens mechanism. One projector that satisfied these requirements was the new RCA 400. We therefore immediately placed orders for a sufficient number of these projectors and proceeded with our developments.

Objective Lens Problem

The next problem was the projection lenses themselves which were lacking in uniformity and definition throughout the field. This was a most important point, because all our care in trying to preserve definition could be dissipated by the use of an inferior projection lens. Unfortunately, we were never able to secure a 16-mm lens anywhere combining both a sufficiently high light transmission with flat-field definition at any price. It is



Large-size portable screen for 16-mm CinemaScope roadshows designed by the Radiant Mfg. Co., of Chicago, has an aluminum frame that can be quickly broken down for shipment from one point to another.

†Journal of the SMPTE, Sept., 1955.

surprising that such little attention is paid to such an important factor in the reproduction of 16-mm films. Producing companies use extreme care, and go to great expense, to secure the finest optical equipment for use in the filming, but in reproduction most pictures suffer because of the inferior quality of the lens used, even with high-priced projectors.

Balancing Screen Light

The next problem was the vast difference in screen illumination between the conventional projection on the normal size screen and the swing over to the CinemaScope field which, because of the much greater area to be covered, cut down the screen illumination almost 50%. In order to compensate for this, we provided a neutral-density filter in the projection lens system to be used during the first half of the film in which normal photography was being used. At the cued point in the picture when the swing over to CinemaScope was achieved, the neutral density filter was removed at the same time as the anamorphic lens was swung into place. This gave the same field illumination for both segments of the film.

The use of this medium is most effective and far reaching. Unfortunately, it can only be used for specific, limited showings such as those described here. It is doubtful whether the time will ever come when widescreen 16-mm projection will be available throughout the nontheatrical field. Each application will present its own screening problems, but for effectiveness and an outstanding way to present a product CinemaScope gives the most dramatic and telling results.

OBITUARIES

WILLIAM R. CONSTANS, 56, member of Columbus, Ohio Local 386, died October 24 at the White Cross Hospital in Columbus. A member of the Local since November 1919, he worked in the projection room of the RKO Palace Theatre from the time it opened in 1926 until his death. His wife and daughter survive him.

• • •

MILTON MOON, 58, member of Los Angeles Local 150, suffered a fatal heart attack on November 17. He had been in failing health for the past six years. Moon held membership in the IATSE since 1916, moving to Los Angeles from Sherman, Texas, in 1918.



More and more Drive-Ins are demanding these fine lenses. The Super Snaplites are guaranteed to give you Sharper Pictures, More Light on the Screen, Greater Contrast, and Greater Definition...and this under the most trying outdoor operating conditions. Actually 7 out of 10 new Drive-Ins install Super Snaplite Lenses...and more and more established Drive-Ins are turning to Super Snaplites. Ask for Bulletin No. 222 it gives you complete information on these lenses.

KOLLMORGEN Optical CORPORATION

Plant:
347 King St.,
Northampton, Massachusetts

New York Office: 30 Church Street, New York 7, N. Y.

PERSONAL NOTES

DR. RICHARD F. MILLER, has been appointed assistant superintendent of the office of film services at Kodak Park. Dr. Miller has been associated with Eastman Kodak since 1937 when he joined the company as a chemist. Since that time he has moved from supervisor of film base production for aero films to supervisor of quality control in his present department. The office of film services provides Kodak with many technical services having to do with film manufacturing and consumer problems.

* * *

JAMES L. WASSELL has been appointed coordinator of the professional equipment and instrument division of the Bell & Howell Co., Chicago, Ill. Formerly associated with the professional motion picture department of Ansco, Mr. Wassell has also done development work on the adaptation of minature film to the mobile chest X-ray technique. He has been a free-lance cameraman, writer, director and cinematographer of 16-mm films.

* * *

DR. C. E. K. MEES, vice president in charge of research at Eastman Kodak, has announced his retirement. He will continue on as a member of the board of directors while residing permanently in Honolulu, Hawaii. He was with the company for 44 years.

Known world-wide for his work in photographic science and complex color photography, Dr. Mees first came to America from England in 1912 at the request of George Eastman to organize a research laboratory at Kodak Park, Rochester, N. Y. Under his guidance, the laboratories grew to include a synthetic organic chemistry department, a school for aerial photography, as well as a department for the development of photographic apparatus. Among the many achievements of the laboratories are home movies, panchromatic films, and various color processes.

In 1934, Dr. Mees was elected vice-president in charge of all Kodak Research Laboratories. In 1936, he was awarded the progress medal of the



Dr. Cyril J. Staud



Dr. C. E. K. Mees

Society of Motion Picture Engineers. He is the author of 150 publications and holds a fellowship in the Royal Society of London, the highest distinction given to any scientist in the British empire. DR. CYRIL J. STAUD has been named vice-president in charge of research at Kodak, succeeding Dr. Mees. Since joining Kodak in 1924, Dr. Staud has conducted organic research, projects on cellulose and cellulose derivatives, and emulsion research. He played an important role in the company's recent development of faster speed black-and-white films. Dr. Staud is a member of SMPTE and the Photographic Society of America. He has been director of the Kodak research laboratories since 1947.

* * *

FRED P. HORTON has been appointed purchasing agent of the Victor Animatograph Corporation of Davenport, Iowa. Horton previously was a member of the Victor accounting department. The present appointment is part of an expansion program of facilities and services by the Animatograph Corp.

Tax Laws Favor Tv

With heavy holdings in both the motion picture and television fields, Herbert J. Yates, president of Republic Pictures of America, is carefully examining the trends in each industry while going ahead with plans for both.

In explaining the recent rapid strides made by Tv in comparison to the movies, Yates pointed out that Tv is "the only amusement with Government subsidy," its costs being tax deductible as business expense by the giant blue chip corporations which sponsor programs. He also emphasized that theatre film production costs have soared to 150% of what they used to be.

Faster Film Foreseen

Photographic film speeds may increase as much as 100 times in the next 75 years, according to an Eastman Kodak prediction.

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Season's Greetings

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BOOK REVIEW

CLOSED CIRCUIT DATA BOOK, 1955, by Leonard Spinrad, 511 East 20th St., New York 10, N. Y., 72 *pages*, $10.

Leonard Spinrad's new data book contains a valuable concentration of facts, figures and pertinent comment on the rapidly growing closed-circuit Tv field. Easily readable, the book moves from a general survey to a detailed rundown of the organizations involved in every aspect of closed circuit Tv.

In it can be found a brief history of closed circuit operations, the position of the government, the labor picture including the unions involved, as well as comprehensive directories of equipment manufacturers, service companies, producers of closed circuit shows and a chronological listing of productions from 1936 through June, 1955. The author makes the point that producers now tend to exaggerate their claims, though he foresees for the future a levelling out of such "fuzzy accounting."

Motion Picture Business Will Grow Instead of Decline

Rising incomes and population, along with a shorter work week, longer vacations, and increased travel are some of the trends A. H. Robinson, treasurer of Eastman Kodak Co., foresees during the next 20 years as contrihuting toward more picture making. This forecast was part of a report issued by Hugh Long & Co. containing predictions for 1975 by American business leaders.

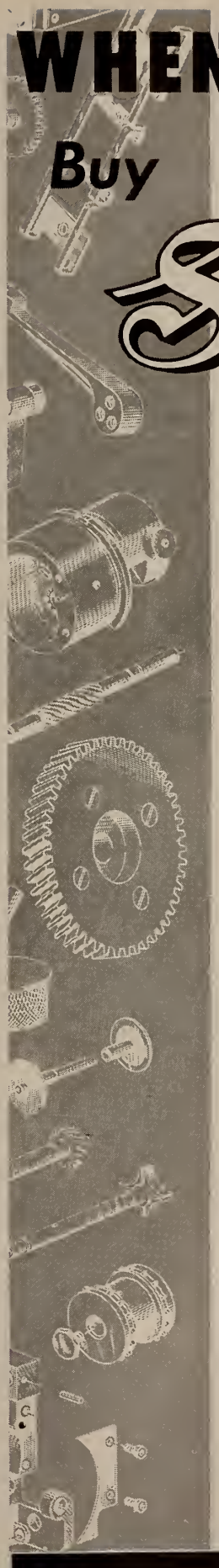
Robinson also foresaw faster film speeds, improved color quality, medical motion picture radiography, and new types of photosensitive materials coming into use.

Composite views of the forecasting group were that the electronics industry in 1975 will represent a $30 to $35 billion business, with automation breaking new ground. Television sets in the U. S. will probably total 92 million, 90% of which will be color receivers.

The industry leaders also predicted that guided robot missiles will range outer space as special television "correspondents," transmitting back to large wall-type home screens Tv pictures of distant planets, and that solar-powered transistor radios will be in widespread use and will last a lifetime.

CinemaScope Lens

A 16-mm Vidoscope anamorphic Lens, designed to reproduce CinemaScope proportions, is now being marketed by the Vidoscope Corp. of New York. The new German made lens may be used interchangeably on any 16-mm camera or projector.



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What Do You Know About Carbons?

The fifth of a series of questions and answers which explain the unique nature of carbon and describe how the substance is utilized so as to provide the brightest of all artificial light sources. Data presented here provided by National Carbon Company.

Why The Condenser Lens?

Application of the high intensity arc to projection through the medium of a condenser lens optical system gave three to four times as much light on the screen as the low intensity arc and further improved the efficiency of light production. Subsequent improvements in the condenser lens system for high intensity lamps raised the efficiency of the optical system to more than five times that obtained from the earliest projection lamps.

Thus improved, these lamps delivered about forty times the amount of light projected on the screens of the first motion picture theatres. This figure, in turn, has been more than doubled by the latest improvements in high intensity carbons and optical systems, making the screen illumination now available ninety times that originally used.

Benefits of the Reflector Lamp

In place of the condenser lens which, in the old type low intensity lamp, picked up a light cone of approximately 45 degrees, the reflector lamp uses an elliptical mirror to pick up more light from the positive crater and focus it on the aperture plate. Both carbons are mounted in a horizontal position with the crater of the positive carbon facing the mirror.

By the adoption of this optical principle the cone of light picked up from the crater was increased from 45 to 120 degrees, and projection efficiency, greatly improved.

The needs of theatres requiring more light than this, but not large enough to require the condenser type high intensity lamps, were met in a similar manner by using the mirror principle with the high intensity arc, in what is commonly termed the "Hi-Low" lamp.

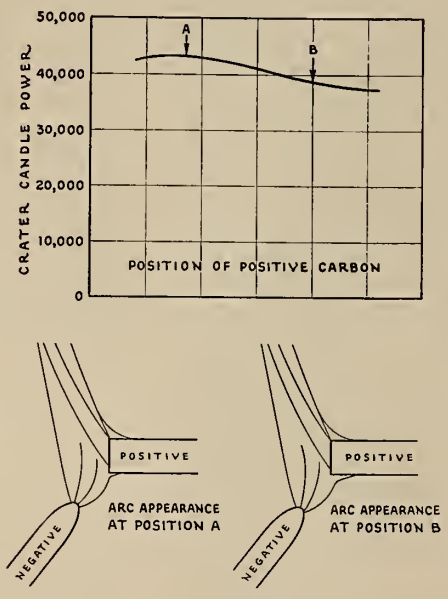
How Does the "High-Low" Lamp Differ From the Condenser Type?

In the "Hi-Low" or reflector high intensity lamp the negative carbon is inclined to the rotating positive, but at a much smaller angle than in the condenser type high intensity lamp. The positive carbon used is 9mm in diameter, and the arc is operated at a current of about 75 amperes, whereas the condenser type lamp uses a 13.6mm positive and an arc current of about 125 amperes or more.

How does carbon position affect light output?

In order to obtain the best results from high intensity carbon arcs particular attention should be paid to the proper position of the positive and negative carbons. The effect on the crater candle power by a variation in the position of the positive carbon with respect to the negative is shown in the accompanying drawing. The arc current is held constant in these tests.

The letters A and B on the curve indicate the values of crater candlepower corresponding to the positions A and B of the carbons illustrated in the sketches



below the curve. At position "A" the bottom edge of the arc flame between the two carbons is located so that its continuation passes through the crater face of the positive carbon. At position "B" the positive carbon has been moved forward so that the flame sweeps underneath it. The arc will burn steadily in either position. However, it is evident from the curves that maximum crater candlepower is obtained with the carbons at position "A". At position "B" the crater candlepower is reduced by as much as 10 per cent.

In most high intensity lamps with rotating positive carbons the negative should be in the same vertical plane as the positive; that is, the carbons should be accurately aligned as viewed from above. Due to the current lead arrangement in some lamps, however, better positive crater formation is obtained by positioning the center line of the negative slightly off the center line of the positive. The lamp manufacturers' instructions for positioning the carbons should be strictly adhered to, because certain lamp characteristics may alter the generally recommended positioning of the carbons.

Operation of the lamp with the positive carbon set ahead of its correct position not only reduces the volume of light but may also result in short carbon life. A protrusion of ⅛ inch beyond the proper setting may decrease the life of the positive carbon as much as 10 per cent.

The use of too short an arc gap may make it impossible to adjust the positive carbon feed to the rate at which the carbon is being consumed. Likewise, if the negative carbon feed is adjusted to feed the negative carbon faster than it is being consumed, the arc will be shortened and the same difficulty encountered.

Can you align a condenser-arc optical system?

Lamp manufacturers specify the distance from the positive carbon crater to the rear condenser lens and the distance from the front condenser to the film aperture, as well as the protrusion of the positive carbon from the contact jaws or flame shield. These distances should be maintained accurately and the positive crater should be accurately aligned with the condensers, film aperture and projection lens.

Some lamp manufacturers supply devices for properly aligning the carbons and optical system. One device employs a dummy condenser and a dummy projection lens, each made of light weight metal to fit the respective holder, and mounted in place of the real lens where alignment is to be checked. This is accomplished by moving the respective elements so that a straight steel rod will pass in turn through the positive carbon contact, the center of the dummy condenser lens, the center of the aperture, and the center of the dummy projection lens. The optical alignment should be checked periodically and always checked after any adjustment of the equipment involving moving of the lamp house or projector head.

Paramount Selling Shorts to Tv

Paramount Pictures is now in the middle of negotiations involving the sale of nearly 2000 short subjects to be used for television. The package deal, said to be worth around $4,500,000, represents practically Paramount's entire library of back-numbered reels, consisting mainly of cartoon, musical, and sports items.

SOLAR FURNACE RESEMBLES PROJECTION ARC LAMP

(Continued from page 29)

and efficiency is low, but the realistic hope is that it will be further improved. The high cost of silicon used in the battery is one of the problems to be faced.

Many scientists are urging all-out solar-energy research on the grounds that the supply of common fuels is declining while the need for power is increasing. They point out that earthly energy sources are limited in quantity and mostly nonrenewable.

It has been said that solar power has an even greater potential than atomic power. According to Dr. Farrington Daniels, a world wide leader in the search for new energy sources, the volume of potential solar power is as much greater than the potential power in the atom, as atomic energy is greater than ox power.

CBS vs NBC on Color TV

The outlook for color Tv as viewed by two large national networks, CBS and NBC, are as different from each other as night and day. CBS, aside from one or two contractual commitments, has been seriously contemplating dropping all color programming from its schedule. NBC, on the other hand, sparked by RCA, has just appropriated $12,000,000 to go toward expansion of its present color Tv facilities.

In addition to the factors of high production costs for color and a limited audience, CBS's chief complaint is the poor quality "soft picture" that 39,000,000 black-and-white sets receive when a program goes out to 10,000 color receivers. NBC, not exactly mindless of costs but foreseeing greater color Tv set sales, claims that color transmission does not interfere with monochrome reception because of the compatibility of the color system they employ.

It may make an interesting race, with both entries running in opposite directions. NBC is now busy converting Chicago station WNBQ into the first all-color television station in the world. CBS, while questioning the value of color, will certainly be keeping an eye on RCA color Tv set sales. Chairman Sarnoff of RCA has predicted "more than a couple of hundred thousand" such sets to be sold in 1956.

New RCA Drive-In Equipment

A wide variety of drive-in theatre screens and functional lighting equipment, including screen towers which can be adjusted for any degree of tilt for any length of projection throw, is now being distributed nationally by RCA theatre supply dealers. The new line, manufactured by Signs, Inc., of Boston, Mass., and marketed under the name RCA Drive-In Showmanship Equipment, also includes moonlight towers, outdoor marquees, ramp indicators and other lighting equipment.

At the same time, RCA announced a Dyna-Heat in-car heater intended to extend the season for outdoor theatres so that the colder winter months will be included. Described as "small, compact, and lightweight for maximum ease of handling," the heater can be taken into the car and operated by the patron. The new heater comes in two types, 500- and 750-watts, and can operate on either 130-, 208-, or 230-volts.

Correction

In the article, "The Development of the Motion Picture Projector," in the March, 1955 issue of IP, it was stated that the patent number issued to C. F. Jenkins in 1895 for the first projection machine ever made was 586,953. We are indebted to Mr. Glenn E. Matthews of SMPTE and the Eastman Kodak Co. for the correct number of this patent, which is 536,569.

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for want of a show, 

the audience was lost

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DECADE OF FILM PROGRESS

(Continued from page 24)

The inability of dye-imbibition color prints to meet the high standards of image definition demanded by today's wide screens became obvious when CinemaScope entered the field. In the standard Technicolor process, misregistration of the three primary-color records (blueviolet, green, and red) must be guarded against at every stage of the process from operation of the 3-strip camera down to imbibition-printing of the release positives in the three reciprocal colors (lemon, magenta, and cyan). The process is quite complex, for a number of intermediate films, including duplicate negatives and printing matrices, are involved.

Better Prints Obtained

The use of dye-coupler films having "built-in" color greatly minimizes registration difficulties in production practice. There are no registration problems at all when master color positives are used for printing the duplicate color negatives from which the release positives are made. It is customary, however, to take every possible precaution against loss of color quality by printing three black-and-white separation positives from the original color negative. These positives are the masters from which dupe negatives in color are made; and the dupes are used in regular printers for producing the release prints in color.

The extremely good image definition of dye-coupler color prints is due not only to perfect registration of the three superposed reciprocal-color images, but also to the absence of "bleeding," or spreading, of the lemon, magenta and cyan dyes. The dyes are formed in the emulsion layers during processing, and they are insoluble compounds.

The inability of the old-style imbibition prints to give clear images when magnified on the screen may be attributed to registration imperfections and to the tendency of the printing dyes to spread in the gelatine coating of the positive stock. Another annoying factor was the inherent fuzziness of the chemically-treated relief images on the dye-imbibing matrix films—a blurriness which got progressively worse until the worn matrices were replaced with a fresh set for making additional prints.

The troubles which beset imbibition prints have been largely overcome by recent refinements in the process. There still remains a minor difficulty in the resolution of the green record (the magenta dye-image) which has made itself apparent because overall image definition of any color print is determined in great part by this particular image. All in all, modern Technicolor prints have attained a surprisingly high degree of perfection, and are preferred by many producers on account of their relatively low cost.

3-D and CinemaScope

Having just accustomed himself to the splicing and handling of triacetate safety film, the projectionist in 1952 stood at the threshold of even more startling developments in the product with which he daily creates illusions of sight and sound. For in 1952 the 2-strip method of stereoscopic projection *via* polarized light made its debut.

Stereoscopic, or 3-D, movies opened the gates to the ultimate in visual realism, but failed to enter in. Promoters played midwife to a difficult technical innovation, and the 3-dimensional child emerged stillborn. An almost total lack of familiarity with the basic principles of binocular viewing and stereoscopic reproduction on the part of cameramen, producers and film distributors spread confusion in projection rooms and disgusted the public.

Dead despite sporadic attempts to resurrect it, 3-D introduced stereophonic sound reproduction from multiple magnetic tracks. In its earliest form, a separate sound film carrying 3 or 4 magnetic tracks was run in step with electrically-interlocked projectors, a system employing two corresponding picture films in addition to the sound film. With three films running simultaneously in exact synchronism, a break in any one of them could easily unnerve the most intrepid projection crew.

In 1953 the anamorphic process





known by the Fox trade-name of CinemaScope came in, and 3-D gathered up its multiple 5000-foot reels and quietly departed.

CinemaScope transferred the magnetic sound tracks to the single picture film which carried anamorphically-compressed images. The new film confronted the projectionist with several novel problems. First, the iron-oxide sound tracks were applied to the base side of the film, requiring scraping of both sides to make splices. (As an alternative to scraping the base side of CinemaScope magnetic-track film, the tracks may be removed by applying film cement to them and wiping them off.)

Second, the specifications of the magnetic-track film included sprocket-hole dimensions appreciably smaller than the standard. Not only were special splicing blocks needed, but also new sprockets having smaller sprocket teeth.

Magnetic C'Scope Prints

Despite the tender care given these prints by projectionists, even going to the trouble of demagnetizing sprockets, idlers, and steel gate parts, magnetic disturbances are not always avoidable. In some cases these disturbances cause noise in the sound; in others partial erasure of the recorded sound occurs. Especially troublesome is the attenuation of the two tracks in the perforation margins.

The choice of smaller sprocket holes for magnetic-track prints was admittedly unfortunate. Not only is the useful life of the CinemaScope films themselves reduced, but also that of regular prints projected on machines equipped with the new narrow-tooth sprockets. The damage consists of cuts in the pulldown edges of the perforations well in from the corners.

It has been demonstrated conclusively that both CinemaScope and non-anamorphic widescreen pictures are more lifelike and dramatic when stereophonic sound reproduction is employed. The CinemaScope magnetic-track method was a commendable attempt to provide stereophonic sound without the surface-noise difficulties inherent in the multiple optical-track method. Single-channel sound is entirely satisfactory for conventional, 3:4-proportioned pictures; but the effect of single-source sound is unnatural in wide-screen projection, and especially in CinemaScope, which has the highest aspect ratio of all.

The directional-sound process known as Perspecta produces a general stereophonic effect from a single standard optical track "cued" with subsonic signal tones. When the optical reproducing system consisting of soundheads, amplifiers, and speakers are of high quality, the reproduction of optical tracks by the Perspecta method gives good results.

[TO BE CONCLUDED]

65-mm Technicolor Facilities

The whole range of Technicolor laboratory facilities and services from developing of color negatives to motion picture release prints will soon be available for 65-mm films, it was announced by Herbert T. Kalmus, president of Technicolor Motion Picture Corp.

"Installation of 65-mm equipment has been started in response to producer requirements," Dr. Kalmus stated. "The Hollywood plant will be the first Technicolor company to have the 65-mm developing and processing equipment."

The new service is being added to present manufacturing of Technicolor release prints for Cinerama, CinemaScope, VistaVision, Superscope, and conventional type motion picture.

Kalmus said that from these large area 65-mm negatives it will be possible to make release prints in virtually any aspect ratio on 16-mm to 65-mm wide film.

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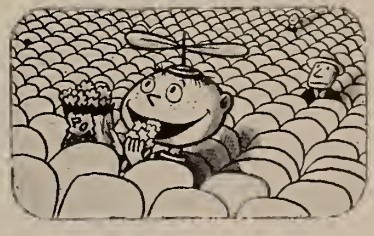
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Portable Cinerama Setup

A portable setup, to be used for Cinerama roadshows, may be ready by the end of 1955. Cinerama engineers, who have been working on the design of portable booths and screen equipment to be used in theatres, field houses, tents, and even open air, have now developed an overall system that will facilitate, among other things, the installation of wiring, electric power and ventilation.

The aim of the portable setup is to increase the number of outlets capable of handling Cinerama. Other developments announced by the company, are an improved printing process to insure image stability and faster lenses for cameras.

Film Exports Increase

Exports of motion picture films and equipment during the first half of 1955 totaled $22,237,794, a gain of more than 20% over the first half of 1954, when such exports were valued at $18,457,874. These figures were released by the U. S. Department of Commerce.

Exports of all types of motion picture equipment, including cameras, projectors, theatre and studio equipment, amounted to $7,627,563 during the first half of 1955 compared to $7,787,265 in the first half of 1954. The only notable increase was in the export of arclamps which totaled 1,597 units valued at $226,627 during the first half of 1955 compared to 477 units valued at $192,597 for the same period of 1954.

SMPTE Wide Screen Booklet

A compact booklet describing the several new methods of motion picture production and exhibition that came into use since 1952 has been published by the Society of Motion Picture and Television Engineers. The booklet offers a comprehensive outline of present day techniques and the ways in which these differ from the ones that became "standard" during the late 1920's. No attempt is made to evaluate the different systems.

IDEAL THEATRE PLANNED

(Continued from page 25)

"peripheral modulation," Smith stated, "Image modulation cannot be a fixed condition but one which varies according to the scene and action therein. The human eye sees a relatively small area with sharpness. Further, in terms of color there are rapid fall-offs to grey in peripheral or side areas of the human angle of vision." "Therefore," Smith continued, "at the extreme sides of the screen image, "It is proposed that a blend of light tone continue and constitute a sympathetic surround—a surround which is obtained from light values derived from the scene being projected and hence truly sympathetic to the natural human way of observing a scene."

To further increase realism, barrier walls will be erected behind each of the eight rows of seats of the sharply-sloping theatre so that the heads of other spectators will not be seen. In addition, double arm blocks and generous aisle space will add to the viewer's comfort.

Another of the unusual features of the dual theatre will be the small size of the audience (250) compared to the large size of each of the projected images (60 x 30 ft.), thus assuring that the picture will completely fill the field of view of the spectators. This is considered to be one of the prime requisites for creating a feeling of realism.

High-Fidelity Sound

As much as realism and participation are sought for visually, so will they also be the goals for the sound reproduction system in the ideal theatre. A 6-channel stereophonic sound system on separate film will be used. Smith defined "good sound as some-

SPLICES NOT HOLDING ?

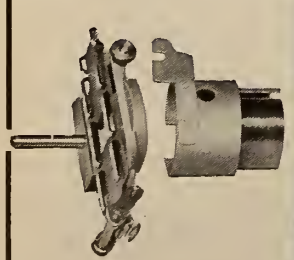
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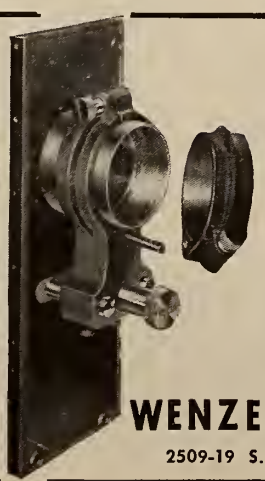
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thing so real that the audience is not 'mechanically' aware of it."

To avoid unwanted reverberations or echoes, the theatre will be designed acoustically dead, with facilities for introducing special effects into the sound channels when desired. Dr. Beranek notes: "Of primary consideration in the design of such a hall is the complete freedom from interfering noises that will arise from visitors circulating in the lobby, air-conditioning systems, and from the movie projectors themselves. Because of the desire of Mr. Schlanger to gain all possible light intensity on the movie screen, it has been decided to replace the usual plate glass window in the projection booth with a sound trap that will pass 100% of the light but will be effective in eliminating noise from the projectors.

"It has also been necessary to deaden the 'pews' in which the audience sits to reduce their own noise and to prevent undesirable reflections of sound from the loudspeakers back into the front part of the auditorium."

In concluding, Smith stated that the production of the orientation film will be related to the method of exhibition. Whereas commercial theatres cannot practically accomplish this, the Williamsburg project has a very unique opportunity in producing a single feature with story, filming, and editing all keyed toward exhibition in a specific theatre designed to exhibit only that feature.

Production of the orientation film is scheduled to begin within the next few months. Construction of the ideal theatres is already under way in Williamsburg, and it is expected that the project will be complete and operating in 1957.

PORTABLE ARCS FOR 16-MM

(Continued from page 20)

to the rectifier. Also included on the rectifier are an AC voltmeter and line-voltage adjustment taps.

The Xenon Arclamp

A new type of light source which has been developed for use on 16-mm projectors is the xenon-arc lamp. Fundamentally the xenon compact arc lamp is an electric arc in a confined xenon-gas medium between two closely spaced electrodes.

The first man to make a compact xenon-arc lamp appears to be Paul Schulz in Germany. In 1951 work was begun by the Hanovia Chemical and Manufacturing Co. of Newark, N. J., on the feasibility of using a xenon-arc lamp for the 16-mm projector used by the Navy.

Some features of the xenon arc are:

(1) A compact optical system can be used since the xenon-arc lamp is an enclosed bulb.

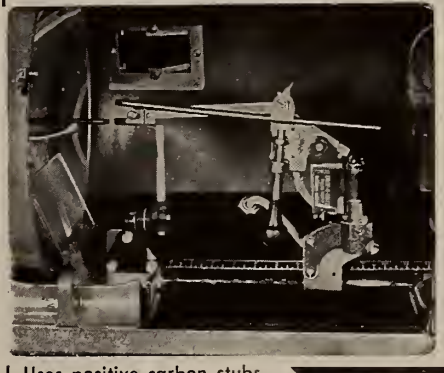


Fig. 4. 46-amp arclamp used with Kodak model 25.

(2) The light from the arc can be pulsed so that no shutter is required on the projector. Power is consumed

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by the arc only when the light is being used on the screen.

(3) The arc requires no more attention than an incandescent lamp and will operate for any length of reel.

To strike the arc automatically and obtain a pulsed light output a ballast and starter are required. The ballast package which is a separate unit consists of a striking and ballast transformer, peaking transformer, striking condenser, line contractor and high-voltage transformer for the pulse coil.

The starter components are the pulse transformer, capacitor and spark gap. When the lamphouse door is opened a line contactor in the ballast will be de-energized, thereby removing all high voltage.

The xenon lamp and striking circuit require 150 volts, 900 va at strike. After establishment of the arc the arc will burn at 30 volts and 30 amps, AC.

This lamp as used on the Navy AQ-2(1) projector is capable of projecting 2000 lumens on the screen with a center-to-side screen distribution of 75%.

RCA MAGNETIC TAPE SYSTEM

(Continued from page 18)

twice as much pictorial information must be carried as is required for just black-and-white television.

Specially designed circuits feed the video signals into the recording heads and carry the signals away during playback into monitors and transmitters. A constant speed transport mechanism regulates the tape flow. This is essential in carrying the tape at a uniform rate past the recording heads, since a variation of speed by as little as one part in 5-million will produce an appreciable jog in the image on the face of a 21-inch Tv picture tube. The model now at NBC operates at a speed of 20 feet per second and can accommodate a 15-minute Tv program on a 20-inch reel.

The tape itself is of a special plastic, a half-inch wide and one mil thick, and incorporates six separate channels on its surface. This total is needed to provide a channel for each of the three primary color signals of red, geeen and blue, for the high frequency signals, for the synchronizing signal that maintains the proper relationship between the colors, and for the audio signal carrying the sound accompanying the picture.

COLOR FILM REPRODUCTION

(Continued from page 12)

ing effects of excessively high levels of illumination, therefore, it is both possible and practical to duplicate the entire gamut of hues, including all the colors of the spectrum, by addi-

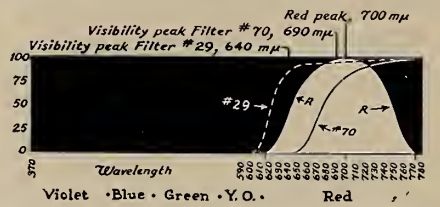


FIG. 9. Comparison of an ideal red filter with two commercial gelatin filters. The filter indicated by the broken line passes "high red," and is scarlet, rather than true red. In appearance it is much redder than ordinary red substances, such as red paint, however. The deep red filter indicated by the solid line is much redder than any object found in nature, and is excellent as a source of primary-red light.

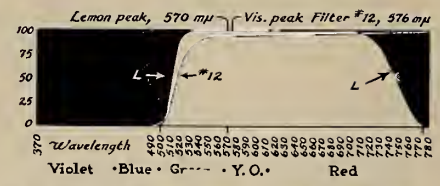


FIG. 10. An ideal lemon ("minus-blueviolet") filter compared with an excellent gelatin filter designed to pass green and red light while absorbing blueviolet.

tive combinations of the three primaries. Fig. 6 reveals the composition of every hue in the entire gamut arranged so that equal intervals along the scale represent approximately equal sensation-differences as regards the combined effect of hue and relative brightness. The thirty hues named and specified at the bottom of the chart are proposed standards.

As we said before, there are several good sources of primary lights for additive color-mixing and evaluation purposes, viz., narrow blueviolet, green, and red bands isolated from an actual spectrum produced by a spectroscope, fluorescent lamps, glow tubes, mercury-vapor lamps, and ordinary white lamps, fitted with glass or gelatin color filters.

Color filters are very convenient, although somewhat wasteful of light, and are satisfactory when they transmit only the desired wavelengths and absorb all the others. Filters are widely used in color cameras and in printing apparatus for making separation positives from color motion-picture negatives, and also for making color duplicate negatives from separation positives.

Figs. 7 to 12, inclusive, have been drawn from spectrograms of certain common color filters of good quality to show what their transmission characteristics are. The clear white areas reveal the characteristics of "ideal" filters having maximum permissible transmission-efficiency. The superposed solid and broken lines show the characteristics of commercially available gelatin filters costing about 50 cents per 2-inch square.

To make the purpose of the spectrograms clearer, let's look first at Fig. 8. It will be seen that the ideal primary-green filter (white area) transmits only a rather narrow band in the green region of the spectrum. This filter "peaks" at 530 mu, the wavelength of primary green. A good gelatin filter, denoted by No. 61, transmits a somewhat wider band including the yellow and orange regions of the spectrum and part of the blue. (Yellow is transmitted at about 25% intensity; and since yellow is a combi-

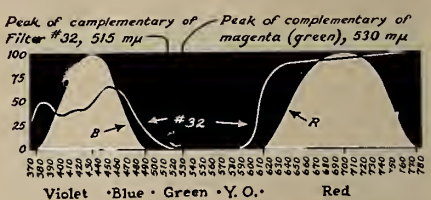


FIG. 11. Comparison of an ideal magenta ("minus-green") filter with one of the best commercial magenta gelatin filters. Perfect magenta dyes having high transmission efficiencies are non-existent; the dye used in this commercial filter, even though carmine-magenta in hue and transmitting too broad a band in the red, is nevertheless very useful in applications requiring the absorption of green light.

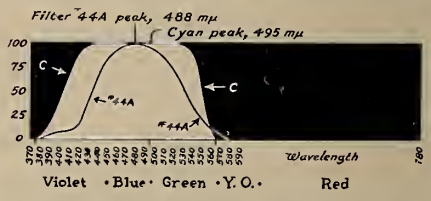


FIG. 12. An ideal cyan ("minus-red") filter compared with an available gelatin filter used for absorbing red light. While extremely serviceable, this commercial filter is definitely bluer than cyan.

nation of green and red, the No. 61 filter may be said to be too red-transmitting for many of the applications requiring primary-green light.) The No. 61 filter peaks at 525 mu, quite close to ideal primary green.

Figs. 7 to 9 give the characteristics of primary-color filters; Figs 10 to 12 those of reciprocal-color filters.

[TO BE CONTINUED]



Mrs. Brown refused to sink

"Keep rowing or I'll toss you all overboard!"

The threat came from a redhead in corset and bloomers, with a Colt .45 lashed to her waist. And as the lifeboat marked *S.S. Titanic* lurched into the waves, she rowed too, rowed until her hands bled.

Mrs. Margaret Tobin Brown had come a long way to take charge of that crowded lifeboat. Once penniless, she now had millions. Once semi-illiterate, she now knew five languages. Once spurned by Denver society, she now hobnobbed with nobility.

But, as she said, "You can't wear the social register for water wings." Her $60.000 chinchilla cloak covered three children; her other outer garments she had given to elderly women. She swore, threatened, sang grand opera, joked—and she kept her boatload of wretched survivors going till rescue came.

Asked how she'd done it, she replied, "Typical Brown luck. I'm unsinkable." But it wasn't luck. It was pluck. And Americans have always had plenty of that smiling, hardy courage. When you come to think of it, that's one reason why our country's Savings Bonds rank among the world's finest investments.

For 160 million determined Americans stand behind those Bonds.

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Yes, the beauty of the SIMPLEX X·L is more than in its picture — for this is one mechanism that's been designed for the *projectionist* as well as for the audience!

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